Dental Digest

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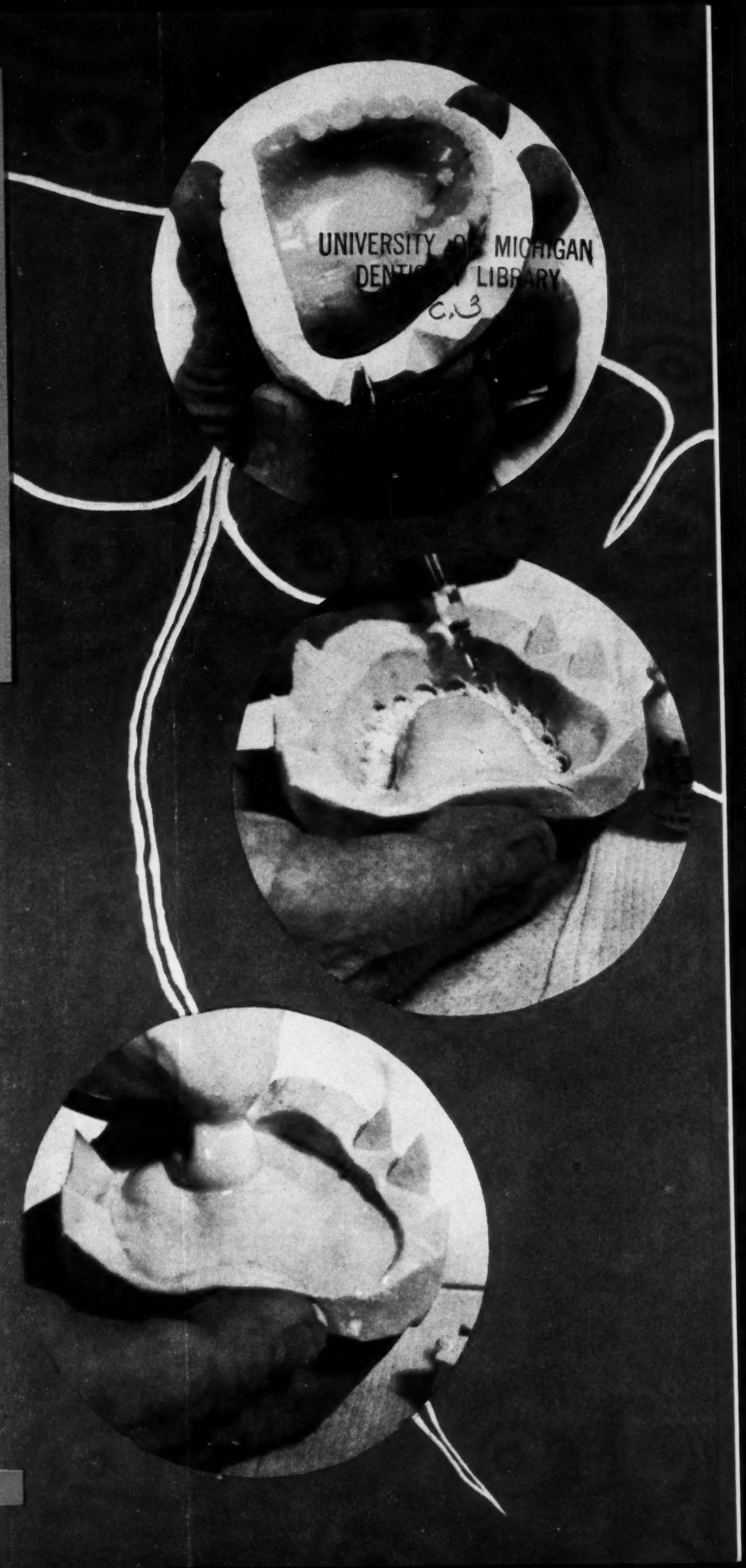

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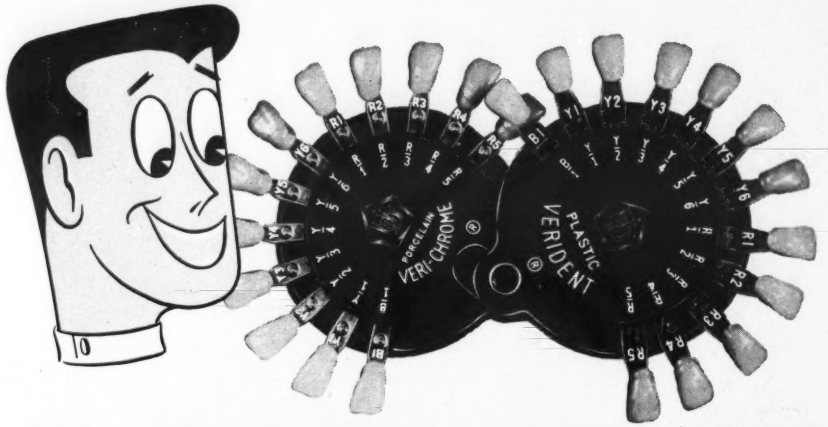

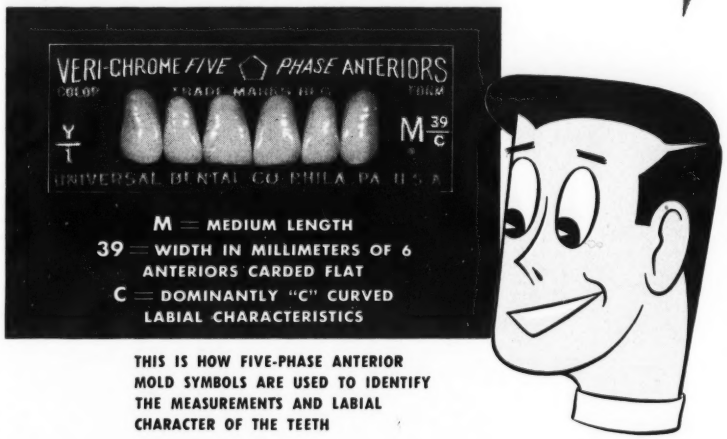
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M MEDIUM	M36/C	M39/C M39/F	M40/C M40/F	M42/C M42/F	M43/C M43/F	M45/C M45/F	M46/C M46/F	M48/C M48/F	M51/C
S SHORT		S39/C S39/F	S40/C S40/F	S42/C S42/F	S43/C S43/F	S45/C S45/F	S46/C S46/F	S48/C S48/F	
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JOSEPH D. LIEBERMAN, D.D.S. (University of Nancy, France, Faculty of Medicine, 1935), D.D.S. (University of Montreal, Faculty of Dentistry, 1938), D.D.S. (Dalhousie University, Nova Scotia, 1941) emphasizes prosthetics in his practice. For his first appearance in DIGEST Doctor Lieberman presents BIOFLAVONOIDS IN PERIODONTAL DISEASE: A NEW THERAPEUTIC APPROACH.

REUBEN FELTMAN, D.D.S. (The Thomas W. Evans Dental Institute, University of Pennsylvania, 1930) is Associate Dental Surgeon at the Passaic, New Jersey General Hospital and is the principal investigator in Dental Research Project D 70 which is a grant by the United States Public Health Service, U.S. Department of Health, Education and Welfare. Among the associations of which he is a member are Academy of Medicine of New Jersey, American Academy of Dental Medicine, American Institute of Dental Medicine. Doctor Feltman's biography appears in the Biological Sciences section of the Ninth Edition of *American Men of Science*. Doctor Feltman who has published several articles on phases of fluoridation of water presents in this issue PRENATAL AND POSTNATAL INGESTION OF FLUORIDES: A PROGRESS REPORT.

HARRY L. PAGE, educated at Hotchkiss and Yale, has been a regular contributor to DIGEST since 1951 when he presented the first of a series of articles concerned with the problem of articulation. This month his article is THE ENVELOPE OF MOTION.

CHARLES SOMERVILLE DILLON, D.D.S. (Baltimore College of Dental Surgery, Dental School, University of Maryland, 1931), L.D.S. (Royal Faculty of Physicians and Surgeons, 1938) contributes another informative article on the subject of fluoridation of public water supplies with THE SIGNIFICANCE OF FLUORIDATION STATISTICS.

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Immediate DENTURE DUPLICATION

WILLIAM L. PEECOOK, B.A., D.D.S., Hartsdale, New York

DIGEST

This article is a practical step-by-step description of a technique to be used in an immediate duplication of a denture. The important steps in the procedure are illustrated.

General Indications for Duplication

Examples of occasions when the immediate duplication of a denture is desirable are (1) when a broken vulcanite case must be sent to the laboratory for repair at a time when the patient cannot be without the denture for social or business reasons, or (2) when a patient may wish to have an extra denture to take on a trip.

Equipment and Materials Required

Only a small space is required for storing the equipment and materials which are to be found in most dental office laboratories. The following items are needed:

1. Clean working surface
2. Bunsen burner
3. Sticky wax
4. Wax spatula
5. Rubber bowl
6. Plaster spatula
7. Plaster knife
8. Rubber band
9. Impression tray
10. Alginate
11. Vaseline
12. Self-curing acrylics (tooth color and pink with liquids)
13. Mixing jars
14. Dropper
15. Cement spatula

Steps in Procedure

1. If the denture is broken, approximate the pieces carefully and lute with sticky wax (Fig. 1).

2. Lubricate the tissue surface of the denture with a thin coat of vaseline.

3. Gently vibrate a mix of plaster onto the tissue surface of the denture, invert the case and seat it into the remainder of the mix on a glass slab. Impression plaster may be used to speed work if desired.

4. Trim the setting plaster with a knife to form a wide art border at the level of the extent of the flanges of the denture buccally and lingually. For a lower denture fill the tongue space across at the level of the extent of the flanges (Fig. 2).

5. When the plaster has set, cut several V-shaped notches deeply into the art border (Fig. 3).

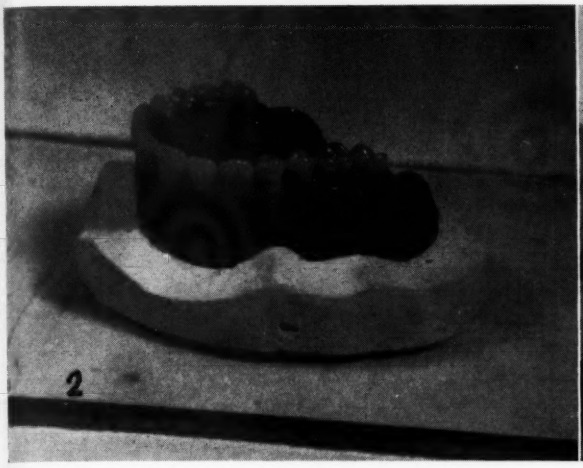
6. If necessary, fill in discrepancies such as broken teeth, or nicks in the denture base with wax.

7. Remove the sticky wax that was applied to retain the pieces if repairing a broken denture, but do not separate the denture from its cast.

8. Select a large perforated tray that will clear the denture by at least one quarter inch all around (Fig. 4). Using a generous mix, take an impression of the denture allowing excess alginate to flow out over the art border to fill the notches. Before taking the impression soak the denture and cast together in warm water for a few minutes to bring about better setting conditions for the alginate against a warm surface.

9. When the alginate has set, trim away the excess flush with the vertical wall of the cast. This will reveal the

1. ***Sticky wax used to lute pieces of broken denture.***



2. *Plaster cast trimmed to denture flange outline.*

3. *Notching art border of cast before taking impression.*

alginate filling the notches previously cut into the cast (Fig. 5).

10. Separate the impression from the denture. Pry the denture carefully from the cast. The denture is now set aside.

11. Lubricate the cast with vaseline.

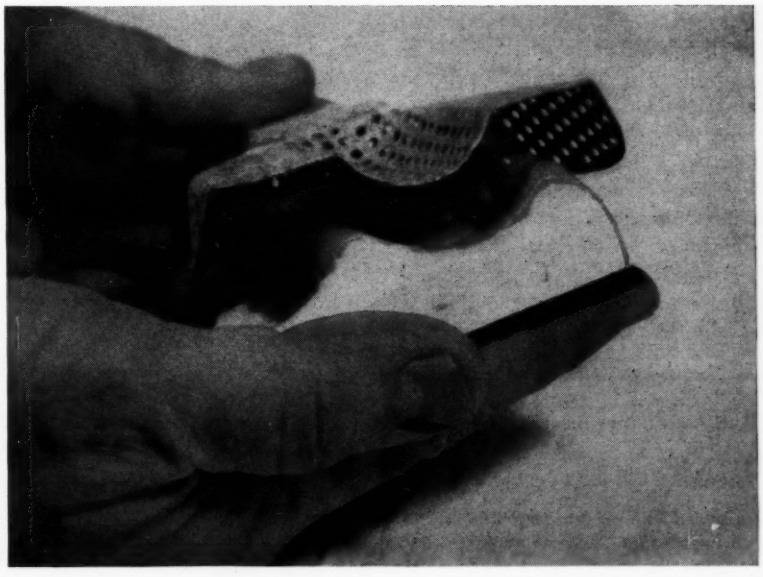
12. Place tooth-colored acrylic powder of selected shade into all of the tooth impressions in the alginate. Add just enough monomer with a dropper to moisten the powder completely (Fig. 6). Add additional powder now and moisten as before to compensate for shrinkage of the original application. Good adaptation can be obtained by teasing the mix with a wax spatula up to the gingival margins of the impressions of the teeth. This should be done carefully especially in the anterior region.

13. Without waiting for the tooth acrylic to set, prepare a mix of self-curing pink acrylic using an excess of monomer to ensure complete fluidity of the mix. The mix should be just thin enough to pour slowly. As soon as the powder and liquid are thoroughly stirred, pour the mix directly from the jar into the alginate impression over the tooth acrylic to cover the entire denture base area to an excess (Fig. 7). If the pink acrylic is mixed too thick to pour, quickly thin it with a few drops of monomer, stir, and pour. Do not attempt to mold a mix that is too thick to pour; it will stick to the fingers and displace the carefully applied tooth acrylic.

14. Bring the impression and lubricated cast together immediately and press firmly into position. The notches in the cast and the corresponding ridges on the impression serve as an index for the seating procedure. Wipe away excess acrylic as it escapes and continue gentle firm pressure. When no more acrylic is expressed and the alginate impression is seated accurately on the cast, place a rubber band around the cast and impression tray to maintain gentle pressure during the setting of the acrylics (Fig. 8).

15. In about 15 minutes separate the impression and cast and remove the new denture. Inspection of the denture at this point will reveal any discrepancies that should be corrected by the brush-on technique.

16. Grind off molding flash and polish the denture. The result is an acrylic duplication of the original denture (Fig. 9).



4. *Selection of oversize perforated tray.*

Laboratory Time

The time elapsed from the beginning through final polishing when impression plaster is used is about 45 minutes. More time is required on the first case, but a single experience eliminates minor errors and wasted movements. The patient is instructed to wait or to return later depending upon the time available to the dentist. An efficient assistant can complete Steps 1 to 7 if desired.

Applications

While the technique is intended primarily for use in emergency to produce a quick duplication of a denture, a refinement can be added. If the original denture has loosened or if it is not badly broken and can be held firmly together with sticky wax, it can be used as a tray to take a wash type impression with the patient in centric occlusion. The working cast is then poured from this impression.

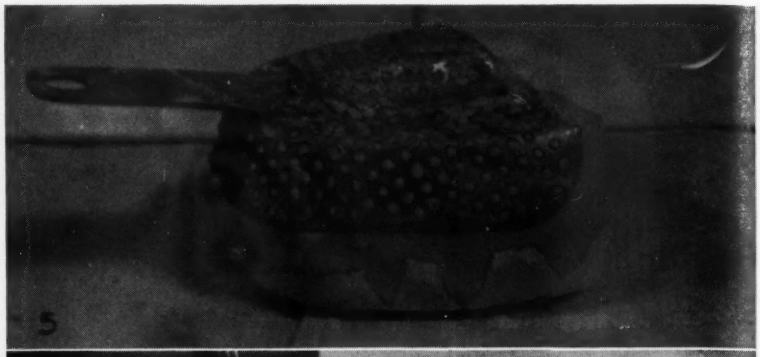
Adjustment May be Needed—In this way, the new denture has a better fit, but the need for adjustments arises.

Semi-permanent Duplication—The latter procedure is not recommended as a substitute for a new denture. For a patient with a financial problem, however, it could be an appreciated semi-permanent duplication.

Precautions

Care should be taken in this technique to avoid contamination of the stock powders and liquids. Work deliberately, being sure to place the dropper on a clean surface and to wipe spatulas clean after mixing before dipping back into stock.

Blending at Gingival Margins—The pink base acrylic may blend with the tooth acrylic at the gingival margins somewhat, but the effect is

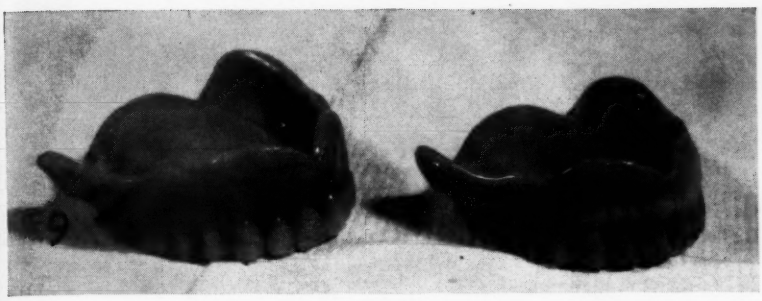


5. ***Alginate impression trimmed to cast.***

6. ***Monomer is added to powder in impression.***

7. ***Mixed in jar, base acrylic is poured into impression.***

8. ***Rubber band maintains pressure as packed impression hardens on cast.***



9. ***Duplicated denture (left) after polishing, shown with original.***

minimized by the individual outlines of the teeth and by the careful application of tooth acrylic in Step 12.

Temporary Burning Sensation—Since an excess of monomer is used in this technique to allow the mix to be poured, ordinary self-curing acrylics might produce a burning sensation for a time in certain patients through the effects of residual monomer. The pink acrylic used may be of the type specially treated for immediate rebasing such as Dura-Base. The monomer in this product is less irritating to the mucosa.

Possible Deterioration of Acrylics—In any case inform the patient that self-curing acrylics are not so dense as slow-curing acrylics and are, therefore, subject to possible discoloration and more rapid wearing.

285 *South Central Park Avenue*

Bone Changes from Fluorides in Water

Evaluation Made

To evaluate the systemic effects of fluorides in water, a study has been made of the medical records and spinal and pelvic roentgenograms of 170,000 patients at the Scott and White Clinic during the period 1943-53. The patients were residents of Texas and Oklahoma, where there are more than 250 towns having a water supply containing 0.7 or more parts of fluorides per million.

Earliest Changes Noted

Changes attributable to fluorides were found in only 23 of the 170,000 people. The earliest changes were noted in the pelvis and lumbar spine and consisted of slightly increased bone density and a "ground glass appearance." The skull and extremities showed no changes except for slight roughening of the bones of the forearms or legs in a few patients. Pelvic ligaments commonly were calcified. There was no cortical thickening or increased bone size. There was no unusual incidence of anemia, arteriosclerosis, arthritis and renal disease.

Bone Changes Minor

The bone changes that were found were minor and harmless, it was concluded, since no systemic effects could be correlated with them, and the patients reported no symptomatology which could be attributed to the bone or ligament changes.

From *Journal of the American Medical Association* **160**:24 (Feb. 4) 1956.

Temporomandibular Arthrosis

DISEASE of the temporomandibular joint may manifest itself in symptoms ranging from simple clicking to pain in the joint radiating to ear and temple, with tinnitus, deafness, and possibly dizziness.[1] In an analysis of patients presenting with lesions of this joint Hankey[2] found that women aged 20 to 30 were most commonly affected. Twenty per cent of cases were due to extrinsic trauma—a blow, a fracture, or a difficult dental extraction. Among the cases due to intrinsic trauma, dental disturbances, such as malocclusion and overocclusion, were the commonest causes. Over half the patients complained of a click, which was almost always unilateral, and was associated with pain in the joint or was referred either along the auriculotemporal nerve or along the second or third divisions of the trigeminal nerve. Movements of the jaw were usually either irregular or restricted.

Probably the usual treatment is excision of the intra-articular meniscus; and exclusion of the condyle of the mandible, particularly when true arthritic changes are present, is also of value. But these measures were applied in only 20 of the 150 cases described by Hankey, who found that in most cases symptoms were much relieved by rest with or without dental wiring, or conservative dental treatment with the provision of dentures where necessary. With proper dental care disease of the temporomandibular joint might become less frequent.

From *Lancet* No. **6852**:1318 (Dec. 25) 1954.

[1]Costen, J. B.: JAMA **107**:52 (1936).
[2]Hankey, G. T.: Br. Dent. J. **97**:249 (1954).

BIOFLAVONOIDS *in Periodontal Disease:*

A New Therapeutic Approach

JOSEPH D. LIEBERMAN, D.D.S., New York

DIGEST

This article describes the results of the application of a bioflavonoid (Hemocoavit®) in combination with ascorbic acid as a specific for the extreme gingival symptoms encountered in periodontal disease.

Major Dental Problem

One of the major problems in dentistry, especially in patients over thirty-five, is that of periodontal disorders. One authority has stated that periodontal diseases cause the loss of more teeth than all other dental diseases combined. Hill[1] supplements that opinion with the comment that such periodontal conditions are frequently the focal sites of infections, likely to spread by the blood stream and cause serious problems in tissues outside the oral cavity.

No Age Group Immune—While it is true that periodontal problems predominate in the older age groups, they are not by any means confined to the elderly, but may be found at almost any age, even among the adolescent and young adults in which caries is usually the principal pathologic problem.

Symptoms—Among the chief characteristics of periodonal disorders are soft, swollen, tender, reddened gingival tissue associated with capillary oozing and at times even frank venous bleeding, especially on the slighest trauma, such as the use of a moderately stiff bristled toothbrush. A review of the anatomic relationships of the structures involved reveals the basis for gingival bleeding.

Anatomic Structures Involved—Soft tissues covering the alveolar processes and hard palate continue as the gingivae from the crest to the cervical portion of the tooth crown. Microscopically the gingivae exhibit a superficial epithelial layer, attached to the enamel or cementum of the teeth and covering a deeper layer of loose connective tissue stroma. The gingivae have an extremely rich blood supply derived from the periodontal and periosteal vessels. The supportive connective tissue stroma of each dental papilla contains an arteriole terminating in a characteristic capillary loop and returning as a venule.

Extensive Effects of Trauma—Any injury to the gingivae whether infectious, toxic, or traumatic may well be accompanied by damage to the vast capillary bed concerned, and result in capillary oozing or even frank venous hemorrhage.

Nutrition and Gingival Health

The fact that periodontal disease is comparatively infrequently encountered in persons, even in their middle and later years, whose general health and nutritional state are normal should be emphasized. Goldman[2] states "the effect of general health upon the gums is not fully understood," but there seems to be no question that nutrition, endocrine dysfunction, diabetes, allergic conditions, and certain of the blood dyscrasias, to mention a few of the more important factors, do exert profound effects. The gingivae of persons whose general tissue resistance is lowered by some systemic disorder are particulary vulnerable to infection or other disease.

Vitamin C Deficiency—Among the nutritional disturbances preeminent in relation to nutrition and gingival health are those associated with ascorbic acid (vitamin C) deficiency.

[1]Hill, T. J.: A Textbook of Oral Pathology, ed. 6, Philadelphia, Lea & Febiger, 1949.
[2]Goldman, H. M.: Periodontitus, ed 2, St. Louis, C. V. Mosby Company, 1949.

TABLE 1

Patients Divided on Age Basis

No. Under 30	30 — 60	Over 60
20	70	10

TABLE 2

Patients Divided on Duration of Condition

No. Under 6 Months	6 Months to Year	1 to 5 Years	Over 5 Years
15	20	50	15

TABLE 3

Patients Divided as to Severity of Condition

No. of Cases	Diagnosis	Rx	Results	Improvement
20	Acute gingivitis with bleeding	8 tables for 10 days, 4 tablets for 21 days	Complete recovery	100%
55	Chronic suppurative periodontitis with pocket formation and bleeding	8 tablets for 10 days, 4 to 8 tablets for 12 weeks	Definite improvement	70-80%
15	Chronic gingivitis with some pocket formation and bleeding	8 tablets for 10 days, 4 to 6 tablets for 8 weeks	Near complete recovery	80%
10	Chronic suppurativo periodontosis with pocket formation and associated bleeding	8 tablets for 10 days, 4 tablets for 8 weeks	Definite improvement	65-75%

This may be demonstrated by the frequent occurrence of a low-grade infectious gingivitis among school children, which McCall[3] points out may be the result of, or at least associated with, subclinical vitamin C deficiency.

Improvement with Therapeutic Amounts—With the addition of high therapeutic amounts of vitamin C to the diet is noted relatively prompt improvement of gingivae even with minimal attention to good dental hygiene.

Trauma Produced by Surgical Procedures

Obviously in the presence of the swollen, often seriously infected gingivae of periodontal disease, the trauma produced by surgical procedures for the removal of necrotic tissue, cellular debris, and calculus becomes aggravated. Such trauma is associated with further damage to the capillary bed and results in varying degrees of bleeding of the tissues. Such cases often become extremely difficult problems and are at times impossible to clear up satisfactorily, even with prolonged treatment.

Aid to Maintain Capillary Integrity—While it has been recognized for many years that vitamin C deficiency is associated with the clinical disease scurvy in which typical soft, spongy, hemorrhagic gingivae are one of the diagnostic signs, it was not until the work of Szent-Gyorgyi[4] that the importance of the bioflavonoids (as vitamin P) in helping maintain capillary integrity became established.

Results of P-Factor Deficiency—As knowledge of ascorbic acid metabolism has increased, it has become evident that the hemorrhagic features of scurvy, or vitamin C deficiency, are only incidental to the profound changes affecting the supporting collagenous tissues, and that the deficiency of the P-factor is even more significant in producing the hemorrhagic aspect of the typical pathologic changes of the tissue.

Importance of Bioflavonoids Studied—Since Szent-Gyorgyi's original observation a vast amount of literature has accumulated on the importance of bioflavonoids, culminating in a symposium[5] describing their chemistry and known clinical applications.

Summary of Biochemical Characteristics of Bioflavonoids—(1) A direct effect is shown on capillary integrity, (2) a marked potentiation of action of ascorbic acid, (3) inhibition of hyaluronidase and histamine activity, (4) inhibition of epinephrine oxidation, and (5) an antidicoumaral effect with reported decrease in bleeding and coagulation time.

Bioflavonoids Therapy Studied

Because of the broad incidence and seriousness of periodontal disease, with increased capillary fragility and permeability its most outstanding pathologic aspect and because the synergistic relationship of the bioflavonoids with ascorbic acid in restoring capillary integrity seems to have been thoroughly established in various other conditions, it seemed worthwhile to study the effect of this combined therapy in patients suffering from periodontal disease accompanied by capillary oozing and hemorrhage.

Series of Cases Treated—For the investigation 101 patients ranging in age from 22 to 84 years, whose past histories were known and for whom the usual conventional methods of treatment had not been altogether satisfactory, were put on a preparation (Hemocoavit®) containing bioflavonoids (P-factors), reinforced with ascorbic acid and vitamin K. Additional patients who had not been previously treated by the author were included in the study. The latter cases might be considered as controls.

Results Shown—Fourteen of the cases treated have been picked at random as representative of the entire series, and the results of therapy are shown in outline form in Tables 1 to 4.

Details of Treatment—1. In no in-

[3]McCall, J. O.: JADA **28**:1303 (Aug.) 1941.
[4]Szent-Gyorgyi, A.: Ltsch. Physio. Chem. **255**:126, 1938.
[5]Ibid. Bioflavonoids, New York Acad. Sciences **61** (Feb.) 1955.

TABLE 4

Case No. Identification	Age	Duration	Severity	Previous Treatment	Current Treatment	Results and Comments	Improvement
1. Female	22	6 months	Acute gingivitis with some periodontal pockets, pronounced bleeding	Mouthwashes	8 tablets for ten days, 4 tablets for 21 days	Complete recovery within 3 weeks	100%
2. Female	24	6 months	Acute gingivitis with associated periodontal pockets and bleeding	Scaling, mouthwashes	8 tablets for ten days, 4 tablets for 21 days	Complete recovery within 3 weeks	100%
3. Female	27	Over 5 years	Chronic gingivitis, swollen puffy tissue, pronounced bleeding upon slightest provocation	Scaling Terramycin, mouthwashes	8 tablets for 20 days, 4 tablets a day for 3 weeks as prophylactic continued for 30 days with 30-day interruption	Marginal improvement after 3 weeks, tone of gingivitis continued to improve with time	60%
4. Female	29	6 months	Acute gingivitis with associated bleeding	Mouthwashes	8 tablets for 10 days, 4 tablets for 21 days	Recovery within 2 weeks with no recurrence	100%
5. Male	30	2 years	Chronic gingivitis with associated periodontal pockets, pronounced bleeding and soreness	Mouthwashes	Occlusion balanced, 8 tablets for 10 days, 4 tablets for 21 days	Improvement after 8 days, bleeding stopped completely with no recurrence after 21 days	100%
6. Male	31	5 years	Chronic suppurative periodontitis with shallow pockets formation, severe bleeding	Scaling, local treatments, mouthwashes	8 tablets for 10 days, 4 tablets for 2 months	Improvement within 2 weeks, after six weeks slight bleeding, pocket formation arrested	80%
7. Male	34	2 years	Acute suppurative periodontosis with pronounced bleeding	Mouthwashes, massages	8 tablets for 10 days, 4 tablets for 60 days	Improvement after 14 days, slight bleeding after 60 days	80%
8. Male	35	Over 5 years	Periodontitis with deep pocket formation and pronounced bleeding	Occlusion balanced scaling, mouthwash	8 tablets for 10 days, 4 tablets for 6 weeks	Bleeding diminished after 10 days, appreciable improvement	80%
9. Female	37	Over 5 years	Periodontitis with deep pocket formation, pronounced bleeding, swelling, and pain of gingivae	Scaling, mouthwashes	8 tablets for 10 days, 4 tablets for 21 days	Pain disappeared after 2 days, bleeding and swelling gradually showed marked improvement	75%
10. Male	40	Over 5 years	Chronic periodontitis with deep pocket formation, pronounced bleeding and pus exudate, tooth mobility, pain upon mastication	Scaling, mouthwashes	Occlusion balanced, deep scaling, 8 tablets for 10 days, 4 tablets for 4 months	Improvement after 5 days, pain disappeared, tissue firmer after 3 weeks, bleeding stopped completely after 3 months, arrested pocket formation, general well being	80%
11. Male	55	4 years	Severe multiple suppurative periodontal pockets and gingival bleeding	Scaling, mouthwashes	Occlusion balanced, deep scaling, 8 tablets for 10 days, 4 tablets for 2 months	Improvement after 5 days, tissue firmer after 3 weeks, general well being evident	80%

TABLE 5

Frequency of Periodontal Disease by Sex and Age

Percent With Active or Past Record of the Disease and With Extractions on Account of it Metropolitan Life Insurance Company, Home Office Employees, May 1951-May 1952

Periodontal Status	Percent of All Employees, at Ages									
	16-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-69+
	Males									
Periodontal Disease, Present or past	1.6	5.6	9.0	18.5	32.6	44.1	54.8	60.6	72.5	80.6
Active	1.6	5.6	9.0	17.6	31.4	40.7	49.6	51.4	58.5	68.4
Some teeth extracted	—	—	2.3	1.6	6.6	10.2	17.1	20.4	26.1	35.9
Past Record only	—	—	—	.9	1.2	3.4	5.2	9.1	14.1	12.1
Arrested Process	—	—	—	.2	.1	.3	.7	.2	—	—
Some teeth extracted	—	—	—	.7	1.0	3.1	4.6	8.9	14.1	12.1
Edentulous*	—	—	—	.2	.3	1.4	2.6	6.7	8.1	8.7
Total with extractions	—	—	2.3	2.3	7.9	13.3	22.0	29.3	40.1	48.1
	Females									
Periodontal Disease, Present or past	2.3	4.4	9.2	15.8	29.5	37.9	51.0	55.5	60.4	64.4
Active	2.2	4.2	9.0	15.2	28.1	36.7	46.9	49.7	53.3	50.6
Some teeth extracted	—	.2	1.0	2.1	7.2	10.3	14.9	13.5	19.7	13.8
Past Record only	.1	.1	.1	.6	1.4	1.2	4.2	5.8	7.0	13.8
Arrested Process	—	.1	—	.2	.1	—	.1	.2	—	—
Some teeth extracted	.1	.1	.1	.4	1.3	1.2	4.0	5.6	7.0	13.8
Edentulous*	—	—	—	—	.3	.5	1.8	2.4	4.9	9.2
Total with extractions	.1	.2	1.1	2.6	8.5	11.6	19.0	19.1	26.7	27.6

**All or remaining teeth extracted for periodontal disease.*
†*The data for females relate to ages* 60-64.

From *Statistical Bulletin*, Metropolitan Life Insurance, (April) 1956, p. 9

stance had any systemic type of medication been employed previously.

2. Previous treatment had been local, either surgical or by topical cauterization or astringent applications.

3. In the case of surgery, the treatment had consisted of debridement of necrotic tissue, cleaning out of deep food pockets, and scaling calculus and other detritus from the subgingival surface of the teeth where exposed by recession of the gingival tissues.

4. In all cases former treatment had been associated unavoidably with some degree of trauma, and invariably accompanied by some degree of bleeding, controlled only by cauterization or topically applied coagulants.

Hemocoavit Therapy

Routine treatment with Hemocoavit consisted of the administration of 8 tablets daily for the first 10 days (2 tablets four times a day), succeeded by an additional period of three weeks in which the dose was reduced to 4 tablets daily (1 tablet four times a day). In a few mild cases the lower dosage schedule was employed from the outset for a period of three to four weeks.

General Factors in Treatment—For purposes of discussion the cases can be placed in three age groups:

1. Patients 30 years and under
2. Patients from 30 to 60
3. Patients over 60 years

Distribution According to Degree of Severity—In general it can be said that the mildest cases were seen in the under 30 group, the most severe cases in the middle age group, and the more chronic cases with fibrotic changes in the older age group. There were many patients, however, who were exceptions to this broad generalization.

Index of Systemic Disease—While this report is primarily concerned with an analysis of the effectiveness of combined bioflavonoid-ascorbic acid oral therapy on periodontal disease, certain collateral observations may be made. These bear out some of the comments cited earlier from the literature pertaining to the state of the gingival tissue as an index of systemic disease.

Correlation Noted in Several Cases

—1. One of the most severe cases of periodontal disease was in a young woman of 27 with a known diabetes (blood sugar in the 400-500 milligram per cent range) of several years' duration.

2. In the case of an elderly patient of 84, exacerbation of the gingival condition occurred with each recurrent upper respiratory infection to which she was extremely sensitive.

3. The converse also seemed to be borne out: with the improvement in the periodontal condition the patient's general health improved, while eating and sleeping were also, as a rule, improved.

Summary and Conclusion

This report is concerned with the systemic use of bioflavonoid-ascorbic acid medication in the adjunctive treatment of a series of 101 patients suffering from varying degrees of periodontal disease.

The underlying rationale for such a study is based on the known synergistic effect of these agents upon restoring and maintaining capillary integrity.

Inasmuch as spongy, infected, bleeding gingivae represent one of the major problems in treating periodontal disorders, the control of capillary oozing or hemorrhage by oral medication would be a marked advance in the practice of periodontia.

The use of a particular bioflavonoid-ascorbic acid preparation (Hemocoavit) as illustrated by analysis of 11 representative case reports from a series of 101 cases has been shown to result in the control of capillary bleeding and the restoration of the gingivae to an essentially normal healthy condition in approximately 90 per cent of the cases within a period of 10 to 30 days.

It is suggested that this type of treatment justifies much wider investigation.

Addendum

Since preparing this article, an additional 25 cases have been treated observing the same dosage regime as that described here with equally satisfactory results.

667 *Madison Avenue*

Author's Note: The Hemoçoavit® for this study was supplied through the courtesy of the Wynlit Pharmaceuticals Company of Madison, New Jersey. The formula for the tablets is the following: Hesperidin methyl chalcone, 45 milligrams; rutin, 25 milligrams; esculine, 2 milligrams; menadione bisulfite, 5 milligrams; and ascorbic acid, 50 milligrams.

Dentin Anesthesia with Xylocaine Ointment

FRANZ F. HOFF, D.M.D.

Primary Responsibilities

In preparing a tooth, the dentist is faced with two primary responsibilities: (1) to avoid damage to the pulp; and (2) to keep the patient as free from pain as possible.

The first is basically dependent upon a thorough knowledge and complete understanding of normal and diseased pulp tissue. It is further dependent upon the extent to which undue pressure and rash movements of the bur can be eliminated and to which the heat generated by the drilling operation can be minimized.

The second responsibility, the management of pain, can be effected through dentin anesthesia by means of the topical application of Xylocaine ointment 5 per cent. This preparation contains 5 per cent Xylocaine base (brand of lidocaine, NNR—not the hydrochloride) in a water-soluble, non-irritating carbowax vehicle.* For the purpose of this study, the manufacturer has furnished a special preparation of Xylocaine ointment containing 0.05 per cent methylene blue which has made possible better observation of distribution of the preparation through the dentin.

Drilling Technique Important

The human pulp cannot be exposed to extreme heat or dehydration without irreparable damage. Careful technique is therefore of paramount importance, regardless of the type of anesthesia selected or of the anesthetic agent employed. One of the author's colleagues had been routinely successful in using Xylocaine ointment topically for dentin anesthesia but had observed a greater incidence of pulpal irritation with this method than where dentin anesthesia was not employed. He was obliged to admit, however, that he had taken advantage of the temporarily painless condition of the pulp and drilled rapidly without any consideration of the eventuality of subsequent pulp damage.

Successful Application

The author's experience with Xylocaine ointment for inducing dentin anesthesia prior to excavation and preparation of cavities is of approximately two years' duration. This method has been found adequate for even multiple cavity preparation of the anterior teeth where injection of a local anesthetic produces a feeling of distention which persists for some time and is a source of annoyance to the patient.

Local or block anesthesia is still to be preferred for multiple cavity preparation involving the same quadrant. There is nevertheless no objection to topical anesthesia of the dentin for single teeth of this group.

Technical Consideration

There are two important considerations involved with successful dentin anesthesia: (1) The cavity and especially the dentino-enamel junction around its edges must be made easily accessible; and (2) the burs as well as the ointment carrier or applicator must be considerably smaller than the size of the cavity. Thus, the greater part of the cavity may be reached by air or water without interference by the bur. The small ointment carrier facilitates easy rubbing movements within the cavity, and conveniently glides along the dentino-enamel junction. In proximal cavities, if and when enamel chisels are inadequate, it may

(*Continued on page* 357)

*Astra Pharmaceutical Products, Inc., Worcester, Mass.

Prenatal and Postnatal

INGESTION *of* FLUORIDES:

*A Progress Report**

REUBEN FELTMAN, D.D.S., Passaic, New Jersey

DIGEST

When in 1931 Churchill[1] postulated the relationship between mottled teeth and water with a high fluoride content, he posed the question, "What physiological effects may be produced by fluorides in water?" Today, after twenty-four years of intensive research and investigation, there is still no satisfactory answer. The most generally accepted theory, which is subject to question, is that fluoride ingestion during tooth calcification and maturation alters the apatite structure and character of the tooth enamel to reduce the vulnerability to the initial caries attack. But this is yet to be proved.

Clinical observations that high fluoride intake causes dental fluorosis and that the incidence of caries is elevated in many non-fluoride water areas presented sufficient evidence to convince the dental profession that the problem merited investigation. Study by dental researchers has been principally related to the fluoridation of communal water supplies. The investigation reported here, however, was aimed at determining the effects of fluorides when given in measured, accurate, daily doses in tablet form to pregnant women and in children through the age of eight, during that period when tooth crown formation is under way.

This progress report pertains to the placental storage and transfer of fluoride ingested in sodium monofluorophosphate tablets, each tablet containing 825 micrograms, the effects of NAF and CAF_2 on the blood picture of children, and the untoward reactions and beneficial results occurring with the use of fluoride salts. In the future, after sufficient time has elapsed to evaluate the permanent dentitions, a final analysis will be prepared.

*This study was made possible, in part by research grant D 70 from the United States Public Health Service, U. S. Department of Health, Education and Welfare, and in part by a grant from the New Jersey Dental Research Association, Inc.

Enziflur® tablets were supplied for this study by Ayerst Laboratories, 22 East 40th Street, New York. Sodium monoflurophosphate for the study was supplied by Ozark-Mahoning Company, Tulsa Oklahoma.

[1]Churchill, H. V.: Occurrence of Fluorides in some Water Supplies, Indust. and Engin. Chem. **23**:996 (Sept.) 1931.

[2]McKay, F. S.: Fluorine and Dental Health, Am. Assn. Adv. of Science **19**:4-5, 1942.

Characteristics of Tooth Enamel

Doctors McKay and Black[2] have pointed out that the factors influencing the integrity and structure of the human dental enamel are effective only during the calcification and maturation periods and that the body is incapable of changing the structure of the enamel, except to disintegrate or dissolve it, once it is completely formed. It is logical, then, to assume that any beneficial results from fluorides are derived while the teeth are developing and that the use of fluorides after permanent tooth calcification and maturation is of little value in preventing caries.

Fluoride Administration During Pregnancy

Based on the known characteristics of tooth enamel, a long range study has been instituted involving the administration of fluoride to the expectant mother during pregnancy

1. *Mottling of teeth is shown.*

and to the child until his permanent tooth crowns have fully matured. These fluoride tablets are of three fluoride salts: calcium fluoride (Enzi-flur®), sodium fluoride, and sodium monoflurophosphate, each yielding one milligram of the fluoride ion. These tablets are prescribed for gravid women and for children old enough to understand and follow instructions. Infants and young children unable to properly dissolve the tablet in the mouth receive the drug in fruit juice, vitamin drops, or water.

Patients are Instructed—Each patient is carefully instructed as to the dosage, including the warning that the prescription is a poison if more than one is ingested daily. Eight years of use with the first two enumerated tablets has been without a single case of overdosage. Poisoning by excessive ingestion has not occurred in over a thousand cases.

Presence of Fluorapatite Questioned—In a preliminary report,[3] evidence was offered to demonstrate the possible value of this prophylatic treatment in producing an enamel containing fluorapatite, which is more resistant to the factors involved in the process of enamel degradation. Recently Fischer, et al.,[4] reported that in x-ray diffraction studies of tooth enamel treated with fluoride, calcium fluoride deposition was found and nowhere in the process could fluorapatite be found. This report contradicts the findings of Neuman and his co-workers.[5] This points to the need for basic research on enamel formation and structure and to the effects of fluorides thereon.

Passage of Fluorides from Mother to the Fetus—A correlation between water-borne fluorides and excretion in the urine[6] and placental storage[7] has been demonstrated. A progress report on this study[8] showed the same correlation when the fluoride is given as CaF_2 and/or NaF in tablet form plus a transplacental passage of fluorides from the mother to the fetus.

Placental and Fetal Blood Concentration

Table 1 shows the results obtained from the analysis of placental tissue and fetal blood of seventeen cases who were given one monoflurophosphate tablet daily during pregnancy. As pointed out in an earlier progress report, there is no definite correlation between the placental and cord blood concentrations. The placental concentration varied between 18.6 and 340 micrograms fluorine (F^-) per 100 grams of placental tissue. Cord blood concentrations varied between 4.7 and 83.8 micrograms fluorine (F^-) per 100 milliliters of fetal blood.

Average Concentration Resembles Previous Controls—It is interesting to note that the average concentration more closely resembles the controls previously reported.[8] Furthermore, these results seem to indicate that the fluoride derived from sodium monoflurophosphate does not pass the placental barrier as readily as does fluoride from calcium fluoride or sodium fluoride.

Blood Analyses

One hundred children of varied ages, races, and ethnic groups reporting to our pre-tonsillectomy clinic had blood examinations made preoperatively. In this group were 47 children who had been ingesting fluoride tablets for various periods of time and 53 children who had not had supplemental fluoride therapy and were considered controls.

Unusual Effects Absent—In comparing the red blood cell count, white blood cell count and differential, hemoglobin, bleeding, and clotting time, no unusual effects or differences between the study cases and controls were found.

Complete Blood Examination Necessary—It is now realized that prior to fluoride therapy a complete blood examination should have been made. Such a policy has now been instituted.

Undesirable Effects

Out of the 601 cases in the adult group, six have shown undesirable side effects from the fluoride supplement. Five out of the 495 children have presented evidence of undesirable reactions. This is 1 per cent incidence of side effects.

Reactions in Adults—Included in the adult cases are three cases previously reported.[9] Because the three patients were within two weeks of their expected date of confinement, it was not possible to investigate thoroughly the causes and relationship of the fluoride therapy and the symptoms: two cases of vomiting and one of urticaria. At the time the cases were reported, it was concluded that these symptoms were not the result of the fluoride ingestion, but a reaction to the binder used in the tablets.

Fluoride Possible Source of Side Effects—More recent cases which are reported here seem to indicate, however, that the fluoride itself was the source of the reactions.

Case 1

The patient was a seven-year-old white child with an itchy skin rash, headache, epigastric distress, generalized weakness, and listlessness. Her discomfort was such that most of her time in school was spent in the nurse's room. When the tablets were withdrawn, symptoms disappeared but returned again when therapy was reinstituted. Again withdrawal resulted in disappearance of symptoms. The patient has been symptom free since. The parents of this child refused to allow further experimentation.

Case 2

A report from a physician concerning an experience with a white male child, two and a half years of age when treatment was instituted, states: "Beginning in his first year of life,

[3]Feltman, R.: Prenatal and Postnatal Ingestion of Fluoride Salts, A Preiminary Report, J. Dent. Med. **6**:48 (Apr.) 1951.

[4]Fisher, R. B.; Ring, C. E.; and Muhler, J. C.: X-ray Study of the Postulated Development of Fluorapatite During the Fluoride Treatment of Powdered Dental Enamel, J. Dent. Research **34**:685 (Oct.) 1955.

[5]Neuman, W. F., et al.: The Surface Chemistry of Bone; 11 Fluoride Deposition, J. Biol. Chem. **187**:655-661, 1950.

[6]Smith, F. A.; Gardner, D. E.; and Hodge, H. C.: Investigations on the metabolism of Fluoride; 11 Fluoride Content of Blood and Urine as a Function of The Fluorine in Drinking Water, J. Dent. Research **29**:596 (Oct.) 1950.

[7]Gardner, D. E., et al.: The Fluoride Content of Placental Tissue as Related to the Fluoride Content of Drinking Water. Science **115**:208 (Feb). 1952.

[8]Feltman, R., and Kosel, G.: Prenatal Ingestion of Fluorides and its Transfer to the Foetus, Science **122**:560-561 (Sept.) 1955.

[9]Feltman, R.: Why Universal Fluoridation of Water Supplies?, J. New Jersey Dent. Soc. **23**:1-4 (July) 1952.

TABLE 1
Transplacental Passage of Fluorides

CASE NO.	SOURCE OF FLUORIDE	DAYS OF USE	MICROGRAMS PER TAB. FLUORIDE CONTENT	KNOWN FLUORIDE INGESTED—MGS.		FLUORIDE FOUND MICROGRAMS PER 100 ML. FETAL BLOOD	FLUORIDE FOUND MICROGRAMS PER 100/G PLACENTAL TISSUE
1.	NA_2PO_3F	130	825	107.3		8.2	340.8
2.	NA_2PO_3F	159	825	131.2		25.4	64.9
3.	NA_2PO_3F	165	825	136.1		12.7	64.3
* 4.	NA_2PO_3F	158	825	130.4		26.2	18.6
5.	NA_2PO_3F	41	825	33.8		15.0	94.7
6.	NA_2PO_3F	135	825	111.4		4.7	64.2
7.	NA_2PO_3F	58	825	47.9		7.5	41.7
8.	NA_2PO_3F	187	825	154.3		8.3	40.0
9.	NA_2PO_3F	131	825	108.1		9.4	96.0
*10.	NA_2PO_3F	114	825	94.1		50.7	39.6
11.	NA_2PO_3F		825	38.8	39.6		
	PRENATALS	47	17.7	0.8		24.3	97.8
*12.	NA_2PO_3F		825	132.0	134.8		
	PRENATALS	160	17.7	2.8		83.8	71.6
13.	NA_2PO_3F		825	159.2	162.6		
	PRENATALS	193	17.7	3.4		32.2	74.4
14.	NA_2PO_3F	138	825	113.9	115.1		
	PRENATALS	68	17.7	1.2		12.9	133.8
15.	NA_2PO_3F		825	67.7	69.1		
	PRENATALS	82	17.7	1.4		12.0	58.3
16.	NA_2PO_3F		825	108.9	111.2		
	PRENATALS	132	17.7	2.3		12.8	122.2
17.	NA_2PO_3F	174	825	143.6	146.0		
	PRENATALS	137	17.7	2.4		16.1	53.5
			AVERAGE	107.8		22.4	90.0

Sodium Monofluorophosphate Tablets Giving 825 Micrograms of Fluoride Ion in a Dose of One Daily During Pregnancy. Natalins®, A Prenatal Vitamin and Mineral Prescription.

**Fluoride Concentration of Fetal Blood Higher than Concentration for Placental Tissue.*

after an episode of measles, the child developed an atopic dermatitis, at first involving the entire skin of the body and with usual treatment receding to a controllable state. He was placed on fluoride, 1 milligram, every day. Approximately three days after ingestion of the daily dose, he developed a generalized vesicular type of rash associated with marked pruritus. Upon cessation of the drug, the rash markedly improved in ten days when he was again placed on the fluoride which again resulted with a rash of the same general appearance. After this second episode the use of fluorides was terminated."

Case 3

A 23-year-old well-oriented primipara in the fourth month of pregnancy was admitted to the prenatal clinic on January 7, 1955. She was placed on fluoride tablets, one daily, slowly dissolved in the mouth. After one week the drug was stopped because she developed a rash on her face. The rash looked like chapped blotches of various sizes and shapes, it was scaly and itchy, and covered the entire forehead, right cheek, and chin. The rash did not occur on the left cheek or chin.

Fluoride Discountinued—The patient's face cleared up in three days on discontinuing the fluoride. Upon resuming the tablets the rash recurred in two days, this time accompanied by nausea. Tablets were again withdrawn and symptoms disappeared. Two weeks later the patient returned to the clinic and was directed to take the tablets again.

Development of Serious Symptoms—The patient took the tablets for three days, the rash reappeared and she developed serious symptoms including vomiting with blood showing in the vomitus. The fluoride prescription was discontinued. The patient then continued an uneventful pregnancy and delivered a healthy baby.

General Conclusions from Case Histories

The cases described indicate that certain patients react unfavorably to fluoride therapy. Whether the fluorine acts as an allergen after short term use or whether the fluorine acts as an intoxicant after many months of use, is unknown and should be determined.

Possible Association with Allergy—It has been reported that cases of fluorine intoxication occur in persons with a history of allergy. It is emphasized that a lowered threshold in tolerance to drugs in allergic patients must be reckoned with.[10]

Termination of Undesirable Effects Simple—Whatever the mechanism involved it is simple to terminate the undesirable reaction of fluoride dosage by discontinuing the ingestion of the tablets. If the source of the fluoride is the public water supply, the problem is more complicated.

Additional Investigation Needed—Much has yet to be learned and understood regarding the metabolism and physiologic actions of this element and its salts.

Condition of Teeth

A final analysis of the results of this investigation has yet to be accomplished. To date, however, clinical examination of the teeth of children born to mothers who ingested supplemental fluoride reveals beneficial effects on the deciduous teeth if the salts are added to the diet during the first two-thirds of pregnancy. If the supplement is not started until the last trimester of pregnancy, none of the benefits of fluoride therapy is apparent.

Resistance to Caries Appears Increased—Clinical examination of the deciduous teeth of the offspring of mothers treated early in pregnancy have highly glistening, opalescent-like enamel with shallow grooves and fissures. These teeth appear more resistant to the ravages of caries than the teeth of children of the control group.

Statistical Comparison Required—Before any definitive, final statement can be made, extended study is required. This should include chemical and physical analysis of the exfoliated teeth and a statistical comparison of the caries incidence between the study and control groups. It is too soon to offer even a preliminary report on caries incidence in the permanent teeth.

Mottling of the Deciduous Teeth—Cases of mottling have been classified as slight or mild. Figure 1 shows one of the mild cases. The anterior teeth seem to be undergoing the effects of attrition quite rapidly along the incisal surfaces. Prior to this wearing away, the dental fluorosis was much more evident than it is at the present time. The photograph was taken in February, 1956. The child photographed is a male, white, aged four years.

Discoloration Evident—In the clinical examination a few cases have appeared which involved two matching teeth or more affected with dental fluorosis. Discoloration of a coppery brown color is quite evident.

General Review of Cases Observed

A case history shows an eight-year-old white girl, whose mother ingested Enziflur® tablets during pregnancy. She is one of eight children and the only one who is caries free. The occlusion is perfect. The brothers and sisters vary from ages one to twelve. The parents in this case are enthusiastic about the therapy, stating that all the children have been and are on the same diet and of like habits. Similar results as in this case have been seen frequently.

Extreme Sensitivity of Teeth Relieved—Two cases of children with *amelogenesis imperfecta* or hypocalcification of enamel, resulting in teeth with little or no protective enamel and exposed dentine generalized throughout the mouth, were referred by local health departments. The children could not eat, drink or practice oral hygiene because of sensitivity of the teeth.

Sodium Fluoride Prescribed: Both children were given sodium fluoride tablet prescriptions. One, who started therapy at three years of age, is now nine and has lost no teeth prematurely. She has developed caries in only four deciduous molars in six years, has lost all undesirable symptoms of pain and leads a normal life.

Effects of Treatment: Pain disappeared after only two weeks of therapy. The second child has not been on fluorides as long as the first, but is duplicating the other's progress.

Undesirable Reactions Absent: Fortunately, neither of these two cases developed allergic or intoxication manifestations to the therapy.

Delayed Eruption of Deciduous Teeth—Many children in the study group showed a marked delay in the eruption of the deciduous teeth. This delay is in some instances a cause for alarm by the parents. The second incisor, second molars, and cuspids are the most frequently delayed, in many cases by as much as a year from the accepted average eruption dates. The delayed teeth, when they do erupt, do so in a group, all within a period of a few days with no evident malocclusion. The jaws and teeth appear normal.

Possible Inhibited Thyroid Function—Delay in dentition, as described, is in accord with the work of De Eds,[11] Baume and Becks,[12] and Orban,[13] who suggested that fluorides inhibited thyroid function which in turn delayed eruption of the teeth. Baume and Becks also state that the thyroid regulates the eruption pattern of the teeth and suggest that the pituitary gland[14] is related to development of normal tooth morphology.

Correlation of Effects in Human Beings Impossible

The effect of fluorides on dentition and on the endocrine system cannot be correlated in human beings as it is in laboratory animals. The work of present investigators, however, should not be ignored, for it is en-

[10]Waldbott, G. L.: Chronic Intoxication from Drinking Water, Internal Arch. Allergy and Applied Immunology **7**:70-74 (No. 2) 1955.

[11]De Eds, F.: Personal Communication to the Author.

[12]Baume, L. J., and Becks, H.: Hormonal Control of Tooth Eruption. The Effect of Thyroidectomy on the Upper Rat Incisor—Response of Growth Hormone Thyroxin or Combination of Both, J. Dent. Research **33**:80-90 (Feb.) 1954.

[13]Orban, B.: Oral Histology and Embryology. St. Louis, C. V. Mosby Company, 1949, p. 304.

[14]Baume, L. J., and Becks, H.: Hormonal Control of Tooth Eruption: 11 Effects of Hypophysectomy on the Upper Rat Incisor Following Progressively Longer Intervals, J. Dent. Research **33**:91-103 (Feb.) 1954.

tirely within the realm of possibility that the beneficial effects of trace elements, such as fluorine, could be mediated through the endocrine system. It has been suggested that the fluorides inhibit thyroid function which in turn delays eruption.[11,12,13] If this occurs with the tablet method of fluoride supplementation, it is possible to control the dosage and avoid inhibition of thyroid function. This phase of the fluorine problem merits further research and study.

Summary

Data is presented showing exact quantity of known fluoride that was ingested by gravid women and the amount recovered in placental tissue and in fetal blood. No definite correlation between concentrations in placental and blood could be demonstrated. The quantity recovered was of lower levels when using sodium monofluorophosphate than when using the calcium or sodium fluoride salts.

The effects of fluoride on the blood pictures of children who had been using the tablets for varying periods of time revealed no unusual effects or differences.

One per cent out of 1100 cases presented evidence of undersirable side effects from the fluoride therapy. Skin rashes, headaches, epigastric distress, varying from slight discomfort to bloody vomiting were among the symptoms. The lowered threshold of allergic patients to allergens or intoxicants such as fluoride is discussed. It is pointed out that if fluoride is the allergen or intoxicant, by the tablet method of administration, the source is readily removed by discontinuance of the therapy. This cannot be readily accomplished when communal water supplies are the source.

Clinically, at present, beneficial results to the dentitions are reported as a result of ingestion of fluorides during the first two trimesters of pregnancy. Dental fluorosis of deciduous teeth is reported.

Beneficial effects to cases with hypersensitive teeth due to imperfect development is reported, with sensitivity relieved after but two weeks of therapy.

A marked delay in the eruption of the teeth was noted and the possible cause is cited.

211 *Main Avenue*

Dentin Anesthesia with Xylocaine Ointment

(*Continued from page* 352)

be necessary to resort to small diamond cutting wheels.

Percentage of Failures Reduced— It is suggested that in cases of carious irritation in Tome's fibers, the zones (going from the periphery toward the pulp) are sclerotic, deposition of fat, and the normal portion of dentin fibers. Prior to taking this into consideration, topical anesthesia failed either partly or completely in about 25 per cent of the cases in which it was attempted. The author has found that this percentage of failure is markedly reduced by alcohol and warm air applied to the exposed dentin prior to the application of Xylocaine ointment. This effect may be due to a dispersal of the fatty deposits by the alcohol.

Evaluation of Dentin — Once the dentin has been sufficiently exposed, it is advisable to evaluate its density and quality according to the following classifications: Average-normal, leathery-soft and dense-sclerotic.

Technique for Obtaining Dentin Anesthesia

Average-normal Dentin — Beginning with the water and warm air application, the tooth is kept dry with a cotton roll. Xylocaine ointment is next introduced into the cavity with a small ointment carrier. Using a small ballpoint plugger, the ointment is gently massaged into the dentin with special regard to the dentino-enamel junction. About 40-60 seconds should be allowed before starting to drill. From this point on, water may be used with the air blast if desired.

Leathery-soft Dentin — A small, double-ended-excavator is used to apply Xylocaine ointment, alternately massaging the ointment into the dentin with the convex surface and sealing off layers of the carious area with concave cutting surface. As the harder portion of the tooth is reached, the remaining procedure is the same as that for average-normal dentin.

Sclerotic Dentin—In the sclerotic, transparent portions of the carious teeth of older patients, dentinal tubules, obliterated by calcification, tend to decrease the penetration of Xylocaine ointment with a corresponding impairment of resulting anesthesia. Thus, in such cases, repeated application of Xylocaine ointment may be required as the drilling progresses.

This technique of induction of dentin anesthesia may be outlined as follows:

1. Expose cavity sufficiently.
2. Dry with alcohol and warm air.
3. Massage Xylocaine ointment into dentin with small instruments.
4. Drill under heat control.
5. Repeat application of ointment as needed.

Phenol Contraindicated — Alcohol contraindicates the use of phenol as a cavity disinfectant in view of the serious pulp damage that may result. Beachwood creosote has not produced any noticeable damage. Research to be published soon, may prove that Xylocaine causes no pulp damage.

In all three classes of dentin the results are satisfactory assuming that sufficient time is allowed for absorption of the Xylocaine ointment by the hard tissues. As is the case with any technique, some practice is necessary for the best results, and as the average practitioner refines and improves his technique, he will find that with this procedure and aided by a warm piece of gutta-percha for pressure, resulting dentin anesthesia is sufficient for pulpotomy and pulpectomy. Recognition and proper management of nervous tension is always of considerable aid in securing maximum patient cooperation. Every short cut in the suggested procedure will contribute to disappointment.

Adapted from *New York State Dental Journal* **20**:216-218 (May) 1954.

The ENVELOPE *of* MOTION

HARRY L. PAGE, Valparaiso, Indiana

DIGEST

This article defines and discusses an "envelope of motion." It reveals how little the envelope of motion is understood and illustrates its usage in conjunction with other sound articulation principles.

Knowledge Essential to Understanding

"Many of the men who practice Gnathology or Transographics hide their ignorance behind the mask of intricate machinery. Not often does one outside the fold dare to ask questions for fear of being made to look foolish. They, the outsiders, consider the answers to be double talk. They freeze for fear of being ridiculed and so no questions are asked and the comedy goes on."[1]

Criticism Applicable to Both Factions—To anyone who has made a careful study of either or both subjects and who possesses the training in the allied sciences necessary to understand the mathematical and physical principles underlying them, the criticism quoted is wholly justified. It is equally proper, however, to make the same criticism of many who are "outside the fold." Although they know nothing about the principles or the procedures used in either subject they still do not hesitate to criticize and even condemn.

Adequate Comprehension of Subject Required—No amount of suggestion, be it presented tactfully or stated bluntly, succeeds in convincing the skeptics that they should at least learn enough in the sciences involved to be able to comprehend what is being offered by Gnathology or Transographics before they attempt to comment.

Concepts Based on Same Principle—Although the practical application of Transographics is much simpler and differs radically from a Gnathologic application, both concepts stem from the same principles. These principles are sound. They are inherent in the nature of the universe and were instituted so long ago that their discoverers have been lost in antiquity. Therefore, those "outside the fold" who condemn these principles may be discounted. Their objections will be disqualified eventually. But those within the fold should refrain from being overly vocal in public until they, too, have mastered the principles and understand the terminology about which they are sometimes prone to be too glibly articulate.

Theory not Difficult to Master—There is nothing involved either in Gnathology or Transographics that cannot be learned by any normally intelligent person provided he will take the time and make the study that is necessary. For reasons entirely obcure, however, only a pitifully small handful seems interested and willing to make the effort to be adequately informed.

Authentic Information Rare Among Alleged Experts—Accurate knowledge and information on the subject is not even to be received from a large percentage of self-styled experts. A good example among many available ones can be taken from the lack of understanding of the envelope of motion.

Analysis of Envelope of Motion

A definition of an envelope of motion is to be found in any standard dictionary. Yet in all the years that dentistry has been hearing about an envelope of motion, it is doubtful if anyone, speaker or listener, has bothered to determine just what an envelope of motion really is. Certainly, there has been nothing more than an infrequent, vague allusion to it in dental literature.

Term Used as a Weapon—As a result of this indifference the phrase has come to be used by esoteric clinicians just as Schweitzer has charged: as a club to silence and awe potential questioners for fear that the deficiencies of the speakers, themselves, might be exposed.

Definition Visualized—One way to approach an understanding of an envelope of motion, is to visualize two surfaces that, no matter how or where they move, are always in contact. If two ball bearings are so controlled that they roll all over one another but never part, their envelope of motion will be the total surfaces of both balls. Observe a ball and socket joint where the socket is fixed and the ball has a rod six inches long attached: the envelope of motion of this mechanism is the inside of a hemisphere having a six-inch radius.

Method of Capturing Envelope of Motion—Locating and reproducing the control centers of the mechanism

[1]Schweitzer, Jerome M.: Personal communication.

is the obvious method of capturing an envelope of motion. If, like a working condyle during final closure, it rotates in all three dimensions, then it is necessary to capture the three rotational axes, transverse, vertical, and sagittal: (1) Transverse hinge-axes control rotation in the sagittal plane, (2) vertical hinge-axes control rotation in the horizontal plane, and (3) sagittal hinge-axes control rotation in the transverse plane.

Problem of Articulating Teeth

When the problem is that of articulating teeth more is required than just the operation of capturing the tridimensional envelope of motion controls. The jaw has a definite pattern of functional movement *inside* the envelope of motion captured by locating and duplicating the transverse, vertical, and sagittal hinge-axes.

Complex Referred to in Gnathology—For this reason, what is referred to in Gnathology as an envelope of motion is actually a distal of motion (the limits to which translating condyle movements can extend) and in the sagittal and horizontal planes only.

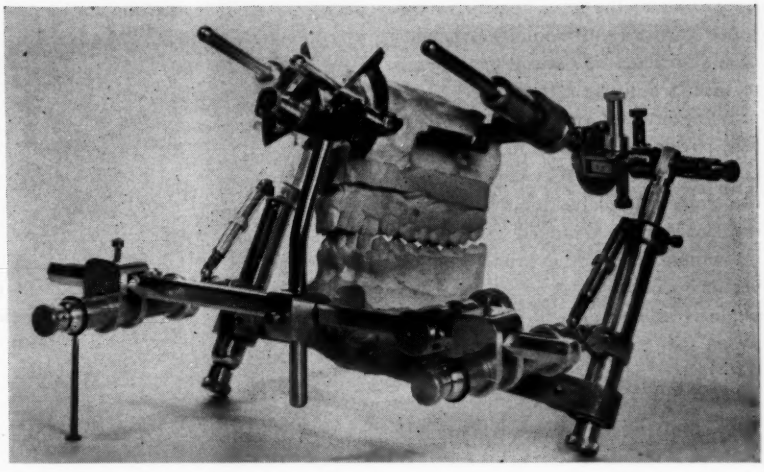
True Pattern of Jaw Function—This pattern is quite different from the "boundary" of condyle movements erroneously credited by Eberle[2] with being an "Envelope of motion."

The Value of Pantographic Tracings—Contrary to Eberle's interpretation, the value of Gnathologic pantographic tracings of radial lateral border movements lies not in finding and transferring the movement "boundaries" of the translating, *nonworking* condyles but in how well these tracings permit location and transfer to the Gnathoscope of the vertical hinge-axes of the *working* condyles.

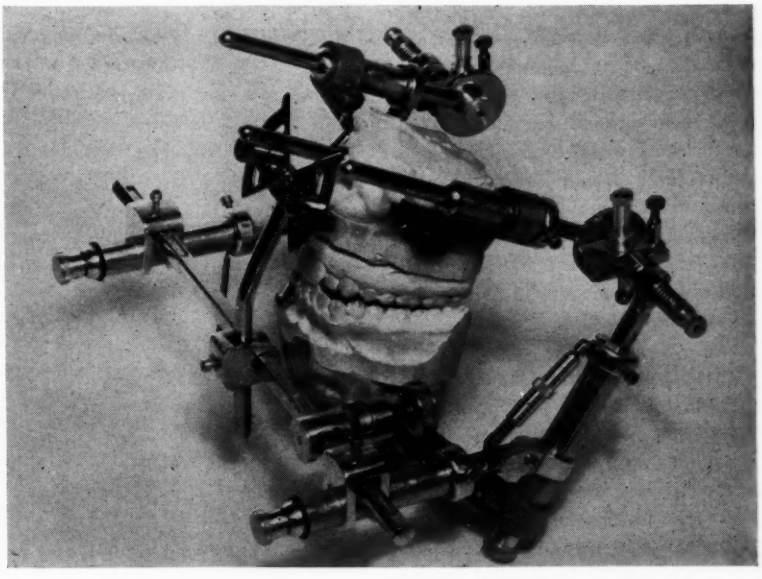
Condyle Path Cannot be Duplicated—Pantographic scribings of jaw *function* show translating condyle movements to be fantastically erratic; not in the least resembling so-called "condyle paths." Condyle paths, themselves, vary as different obstructions in the form of food, interfering cusps or prosthetic mechanisms are encountered at the occlusals, so a condyle "path" is valueless in articulation. Being a variable, it can never be duplicated by any fixed condyle slot in any instrument.

Translating Condyle has no Set Path—A condyle path could be scribed only with the translating condyle braced against and travelling along the ceiling of the mandibular fossa. Just what would hold the condyle there? Not the capsular ligaments, for they hang in loose folds. Certainly, not the masticatory muscles, for the translating condyle is moving toward muscle origin in the radial and protrusive laterals used to record a condyle path. The natural conclusion must be that a translating condyle has no set path. It is a universal joint made so purposely by nature to protect the joint mechanism from injury.

Steep Chewing Angle Required—In the horizontal plane, the patient's pattern of functional movements must not rise above the level of his bruxat-



1. ***Hinge occlusion. The only contact is at the left laterals.***



2. ***Cams set at 40° when bruxomatic level is 45°. Centrals interfere.***

[2]Eberle, W. Roy: The Readers Round Table, J. Pros. Dent. 4:710 (Sept.) 1954.

ing contacts; the level at which combined vertical and medial movements of well-articulated natural teeth begin to meet traumatic interferences. It is only natural, if there is to be any real power in mastication, that there shall be a steep chewing angle in the transverse plane, for the chewing muscles are so arranged as to exert maximum force in a predominantly verticle direction. A steep chewing angle is needed also in most jaws to avoid mandibular movements above the bruxomatic level. One complements the other perfectly.

Anomaly at Left Lateral Shown—Figure 1 shows a set of teeth that are normal in all respects but one: the anomaly at the left laterals is quite apparent. This person, a woman in her mid-twenties, can chew without any preocclusal interferences so long as she chews in the transverse plane at an angle of 45°, or more, above horizontal. Under 45°, a solid interference shows up.

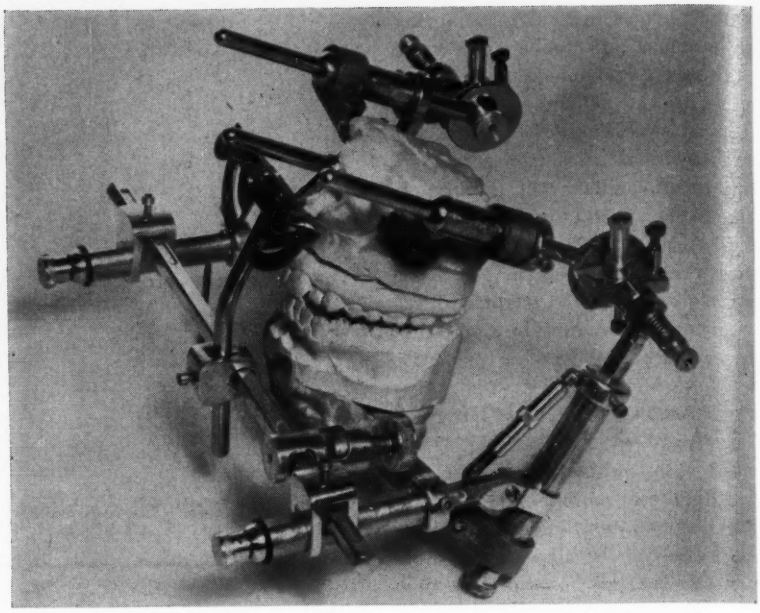
Free Closure Prevented by Interference—Figure 2 shows the cams of the jaw movement guide on a Transograph set at 40° and the jaws being stopped from closing freely by an interference at the centrals.

Interference Revealed—When the cams are dropped completely and conventional laterals or "balance" is attempted (Fig. 3), exactly the same interference reveals itself.

The bruxomatic level of this patient is, then, 45° above horizontal regardless of her anomaly. Any attempt to articulate artificial teeth by using conventional laterals or "balance" in a jaw possessing her bruxomatic level would create trouble. Since the principle is the same, whether the teeth be artificial or natural, an example using this patient's functional jaw movement pattern will be applicable and illuminating.

Principle Demonstrated

Assume that years have passed and the patient cited finds herself middle-aged. Time and neglect have brought her teeth to such a state that full upper and lower dentures are needed. If the occlusals on her working teeth are articulated to traditional laterals and "balance occlusion," her dentist will be working constantly with lateral mandibular movements that are above her bruxomatic level.

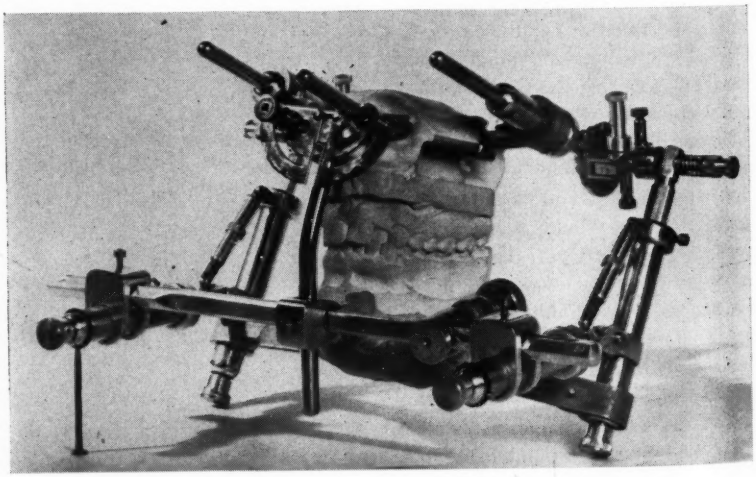


3. ***Centrals interfere in conventional bruxomatic laterals.***

Bruxating Contacts Removed—Without realizing that he is doing so, the dentist will remove all of the bruxating contacts, and hence, all of the contacting efficiency from her molars, leaving her in premature traumatic occlusion on her biscuspids. To achieve "balanced occlusion," he must do so.

Prematurities Found at the Bicuspids—The assertions made in the preceding paragraph can be substantiated by honest observation in all offices where conventional articulation methods prevail. The prematurity complained of by the majority of their edentulous patients is at the bicuspids. So-called "blow-ups," following full mouth reconstruction by traditional concepts are predominantly at the bicuspids also.

Crowns Too Long—It is apparent, too, that if crowns on this patient's working teeth were adjusted to a "balanced occlusion" with her pres-



4. ***Interdentation with minute discrepancies.*** **(*See text for explanation.*)**

ent "incisal guidance," they would be too long.

Articulation Problem Unsolved—The examples described should make it clear that the use of this subject's full envelope of motion combined with the "boundaries" of her condyle movements and conventional "balancing" laterals would fail to solve whatever articulation problem she might present.

Reasons for Failure—Any argument against this observation must (1) recognize and account for the fact that the patient has at present no semblance of "balanced occlusion," (2) is quite unaware of any trouble, (3) can function effortlessly and completely, and (4) that the roentgenographic picture of her jaws reveals perfect health. It must account too for the fact that this is also the rule in *normal* mouths of well-articulated natural teeth.

Cusp and Fossae Relationship Shown—Figure 4 shows how the teeth in this case interdentate in excellent cusp and fossae relationship, the posteriors being held apart less than a quarter of a millimeter by the anomaly at the laterals. The accuracy of the Transograph also reveals that the left condyle is out of hinge position in a similarly minute amount. Even if this tiny discrepancy could be detected by a conventional articulator, it would probably be disregarded by traditional concepts as being of no consequence. With the exception of minor facets at the anomaly, not one tooth shows the slightest abrasion.

Centrals Interfere at Bruxomatic Level—While the anomaly will be corrected in accordance with good dental practice (this will automatically correct the slight occlusal and condylar discrepancies), it is in no way responsible for the interferences at the bruxomatic level of this patient for it is the centrals (not the laterals) that interfere.

Subject's Chewing Angle Normal—Most persons encounter bruxating contacts at chewing angles ranging from 45° to 50°. As a consequence, the actual chewing angle used in function is generally 55° or over. Since this subject's functional pattern calls for a chewing angle over 45°, her envelope of motion must be modified in the articulator to permit her jaws to operate below this limit while the teeth are being articulated. This will inevitably call for and result in sharp, efficient natural cusps with steep inclines such as she now has.

Envelope of Motion Modified by Functional Pattern—A definition of an envelope of motion is the following: "Any curve or surface to which any other curve or surface while moving in accordance with some law is tangent at all times." By the use of the jaw movement guide with its cams in conjunction with the cam follower rod, the required tangency is maintained between the lower jaw and the cranial plane. The latter automatically represents and serves as the entire structure of the upper head including the maxillae, for the cranial plane is made up of three out-of-line points on the cranium, itself. The need for a cranial plane, how it is set up on the head and transferred to the Transograph are described in a previous article.[4]

Summary

The need for better training among proponents as well as opponents of Gnathology and Transographics has been emphasized. An envelope of motion has been defined and explained; its value and limitations in articulation have been discussed. It has been shown why an articulation based upon laterals and "balanced occlusion" cannot succeed.

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[3]Page, Harry L.: An Appraisal of Balance, DENTAL DIGEST **60**:200-204 (May) 1954.
[4]Page, Harry L.: The Cranial Plane, DENTAL DIGEST **61**:152-157 (April) 1955.

How Dentogenic Restorations Interpret the Sex Factor

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Summary

A feminine tooth in a masculine mouth is just as much out of place as a young tooth in an old mouth. The selection of the mold, the teeth, and the denture base, and, most important, the positioning and the coloring of the artificial teeth and denture base should be influenced by the sex, as well as the personality and age of the patient. The prosthodontist can develop into both an artist and a sculptor, with both the artist's and the sculptor's imagination. The dentist must take into account the sex and then discover the personality of his patient which can then be expressed dentogenically in the restoration made for that patient. The laboratory procedures must carry through the artistic concepts of the dentist. There is a degree of masculinity in many feminine patients. There is a degree of youthfulness in many elderly patients. To determine these factors and to balance them with the artistry of practical denture construction is the problem.

From *Journal of Prosthetic Dentistry* **6**:172 (March) 1956.

The Significance of FLUORIDATION STATISTICS

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DIGEST

Every clinician knows from experience that it is seldom possible to diagnose all dental caries at one visit even with the aid of x-rays.

The average practicing dentist is, therefore, skeptical of mass figures computed from a first examination. However thoroughly such an examination might be conducted, the impression lingers that the margin of error is too high to support unquestioning acceptance.

The point arises whether or not the figures presented are applicable to persons or groups of persons. If it is found from the discussion in this article that the figures are not applicable directly to persons or groups of persons, then clearly the calculations of the proponents of communal fluoridation can support no statistical conviction.

Platitudes Stated

Before dealing with the figures in question, two platitudes must be stated:

1. A tooth in which caries does not occur must be counted as a sound tooth and must be credited to the subject or group and included in the statistical evaluation.

2. A tooth is not a dentition but only a part of a dentition. Any statistical figures, therefore, which do not relate teeth to the dentition as a whole are meaningless.

Source of Statistical Data Quoted

In the monograph issued by the Harvard School of Dental Medicine for the American Association for the Advancement of Sciences, Shaw[1] (1954) has compiled a selection of the statistical data. All the figures in this article are quoted from this publication.

Explanation of Method Used by Fluoridation Advocates

The method adopted by the advocates of fluoridation for arriving at their conclusions is the following: (a) In the case of a decrease the average caries rate after fluoridation is subtracted from the average caries rate before fluoridation. The difference is then expressed as a percentage of the average caries rate before fluoridation. For example, taking the experiment in Newburgh, Shaw[2], page 14: six-year-olds, permanent teeth; before fluoridation 8.5 DMF per 100: after fluoridation 1.9 DMF per 100, average difference 6.6. Expressing this as a percentage of the figure before fluoridation, the calculation is $\frac{6.6 \times 100}{8.5} = 77.6$ per cent decrease, as stated. (b) In the case of an increase in dental caries the lower figure is taken from the higher figure and the difference expressed as a percentage of the figure before fluoridation. For example, Evanston, Illinois, Shaw,[3] page 10, 8-year-olds, before fluoridation 5.77 DMF, after fluoridation 6.7 DMF. Taking the lower figure from the higher figure, the average difference is 0.98.

Figures Twice Baked—As there is something especially odd about the figures for Newburgh for both permanent and deciduous teeth, these will be dealt with first (see below).

[1]Shaw, James H.: Fluoridation as a Public Health Measure, Washington, D.C., American Association for the Advancement of Science, 1954.
[2]Ibid., page 14.
[3]Ibid., page 10.

Effects of Fluoridated Water

Place	Age	Before Fluoridation	After Fluoridation	Percentage Decrease
Newburg, N.Y. (DMF per 100 permanent teeth)	6	8.5	1.9	77.6 (D)
Newburg, N.Y. (DMF per 100 deciduous teeth)	5	27.2	10.9	59.9 (D)

The odd thing about these figures is that apparently they are "twice baked."

Reduction Percentage Inferred—The casual observer would deduce from the above figures that there was a reduction in caries in the permanent teeth of 6.6 per cent (that is, 8.5 per cent minus 1.8 per cent), and in the case of the deciduous teeth that there was a reduction of 16.3 per cent (27.2 per cent minus 10.9 per cent), but this calculation would not impress any local Council body. So, consistent with the adopted method, the average difference between 8.5 per cent and 1.9 per cent (6.6 per cent) is expressed as a percentage of the figure before fluoridation, regardless of the fact that the figures have already been expressed as a percentage; that is, $\frac{6.6 \text{ per cent} \times 100}{8.5 \text{ per cent}} = 77.6$ per cent (D). (Second Baking.)

To Calculate Increase in Sound Teeth from Figures—Bear in mind the two platitudes, if there are 8.5 DMF teeth per 100 before fluoridation, there must remain 91.5 per cent sound teeth. After fluoridation the figures show 1.9 DMF teeth per 100, therefore there remained 98.1 per cent sound teeth, the average difference being 6.6 per cent. Using their own method of calculation there would be an increase in sound teeth of $\frac{6.6 \text{ per cent} \times 100}{91.5 \text{ per cent}} = 7.2$ per cent.

Percentages Incompatible — How can a decrease of 77.6 per cent in carious teeth be maintained when, by their own method of calculation, there was an increase in sound teeth of only 7.2 per cent? Clearly these figures do not relate to a person or groups of persons.

Similar Discrepancy in Figures Pertaining to Deciduous Teeth—In dealing with the deciduous teeth and using the same method of calculation as above, how can a decrease in carious teeth of 59.9 per cent be maintained after fluoridation, when there was only an increase in sound teeth of 22.2 per cent?

Author's Method of Computation Compared

No statistical method yet devised is complete, and in describing the following method the author makes no claim other than that the method is in accordance with the principles of sound elementary arithmetic.

The figures to be dealt with are quoted below, and again are taken from the Harvard monograph, page 10. These figures are taken because the average number of teeth per child cannot be disputed. In other data the average number of teeth per child is never stated.

Computation of Percentage — To begin with, the average number of deciduous teeth per child may be taken as 20 up to the age of 6. The average caries figure is expressed as a percentage of the average number of teeth, before fluoridation and after fluoridation. The percentage of carious teeth after fluoridation is then subtracted from the percentage of carious teeth before fluoridation. This gives the percentage decrease in carious teeth. In the case of an increase in caries, the lower percentage figure is subtracted from the higher percentage figure and expressed as a percentage increase.

Example of Method—In Grand Rapids, in 4-year-olds (average 20 teeth) there was an average of 4.2 DMF teeth before fluoridation. Expressing this as a percentage, the statement is $\frac{4.2 \times 100}{20} = 21$ per cent carious teeth. After fluoridation the statement is $\frac{2.13 \times 100}{20} = 10.65$ per cent carious teeth.

Correction of Published Figures—Subtracting the one from the other, the decrease in DMF teeth is 10.35 per cent. This method applies to all of the preceding data showing the author's correction of the published figures or to any of the data given elsewhere.

Average Number of Sound Teeth—Bearing in mind the stated platitudes, if the author's method is correct, then in reply to the question, What was the percentage increase in sound teeth according to the figures? the calculation is the following:

Average number of carious teeth per child possessing an average of 20 teeth being 4.2, means that there was an average of 15.8 sound teeth per child; that is $\frac{15.8 \times 100}{20} = 79$ per cent sound teeth.

Number of Sound Teeth After Fluoridation—After fluoridation the average number of sound teeth was 17.87 (20 minus 2.13). This, expressed as a percentage of 20 teeth appears as $\frac{17.87 \times 100}{20} = 89.35$ per cent sound teeth.

Accuracy of Calculation Confirmed—Subtracting the one from the other, the answer is that there was an increase in sound teeth of 10.35 per cent, thereby confirming the accuracy

Effect of Fluoridated Water on Deciduous Teeth

Place	Age	Before Fluoridation	After Fluoridation	Percent Increase or Decrease	Author's Correction
Grand Rapids, Michigan	4	4.2	2.13	49.2 per cent (D)	10.35 per cent (D)
	5	5.3	2.27	57.7 per cent (D)	15.15 per cent (D)
Brentford, Ontario	5	5.63	2.59	54 per cent (D)	15.2 per cent (D)
Sheboygan, Wisconsin	5-6	4.80	2.2	53.7 per cent (D)	13.00 per cent (D)
Madison, Wisconsin	5	8.14	4.23	48 per cent (D)	19.55 per cent (D)

of the first calculation and satisfying the two platitudes.

Question Repeated

What is the percentage increase in sound teeth in Grand Rapids 4-year olds calculated by the advocates' method?

Since there was an average number of 20 teeth, which cannot be disputed, they must proceed by subtracting the average number of carious teeth from the average number examined, that is, 20 minus 4.2= 15.8, and after fluoridation the figures were 17.87 (20 minus 2.13), the average difference being 2.07 (17.87 minus 15.8). According to the established method, the statement must be the following: $\frac{2.07}{15.8} \times 100 = 13.1$ per cent increase in sound teeth.

Figures Challenged—How can a decrease of 73.2 per cent in carious teeth be maintained when, by the same method, there is only an increase in sound teeth of 13.1 per cent?

False Computations Presented as Sound—It is not the author's responsibility that these figures will not tally or make any kind of elementary mathematical sense. For years this faulty arithmetic has been posing as sound statistics.

The Significance of Small Numbers

On page 15 of the publication by Shaw[4] the following figures appear in a report from Brentford, Ontario.

Important Reduction Claimed—In a 6-year-old there can be at most 12 newly erupted permanent teeth, so newly erupted that there has been little time for caries to occur. One would have thought that the small average number of caries incidence occurring among such a small average number of newly erupted permanent teeth would be considered unsuitable for statistical evaluation, but no, the proponents claim a reduction of 73.2 per cent and put this impressive figure at the top of the list. Actually the decrease is quite small, being 2.50 per cent and under the special circumstances, insignificant.

Different Group of Children Examined—The 6-year-old children who were examined in 1944-45 were obviously not the same children who were examined in 1951, as the 6-year-olds would then be between 12 and 13. Must any statistical evidence regarding these particular newly erupted permanent teeth be lost forever in the case of the particular children under examination?

Statistical Evidence in Same Group of Children—If the 6-year-olds of 1944-45 before fluoridation are the same children as the 12-year-olds in 1951 after fluoridation, another absurd situation arises:

In 1944-45 these 6-year-olds had 0.41 DMF in permanent teeth. In 1951, after fluoridation, as 12-year-olds, when at most 16 more permanent teeth have erupted (most of them newly erupted) there was an average caries rate of 4.31, the difference being an increased DMF rate of 3.90.

Deterioration Between Six and Eight Years—This ridiculous situation is emphasized by inquiring what was the rate of deterioration between the ages of 6 and 8 years before and after fluoridation, calculated by the proponents' method. The answer is 495.1 per cent degeneration before fluoridation (that is $\frac{2.03}{0.41}$ average difference x 100=495.1 per cent increase). After fluoridation the answer is 872.7 per cent degeneration (that is $\frac{0.96}{0.11}$ average difference x 100 =872.7 per cent increase).

Statistical Claim not Supported—The figures given do not support a claim of 56.1 per cent decrease for the 8-year-old group, because the figures show, by the advocates' method of calculation, that the rate of deterioration of dentition between 6 and 8 years was nearly twice as rapid after fluoridation as before fluoridation, and between 8 and 10 the deterioration figure was more than twice the figure before fluoridation, being 55.7 per cent before fluoridation and 140.2 per cent after fluoridation.

Data for Deciduous Teeth

Continuing the established method of calculation, it is interesting to examine the rate of increase or decrease in dental caries in the age groups 4 to 10 according to the Grand Rapids data for deciduous teeth.

Statement Ambiguous—The figures in the Grand Rapids calculations for the effects of fluoridation on deciduous teeth would seem to belie the significance of the claim given in the original report: for example, from these figures it cannot be concluded that the decrease of 37.14 per cent in the 9-10 age group (1951-52) was in fact due to fluoridation, since in the same age group before fluoridation there was a decrease of 39.13 per cent. Nor can it be argued that the increase in caries rate of 18.44 per cent in the 5-6 age group before fluoridation was due to a lack of fluoride in the water, for after fluoridation in the same age group there was a deterioration of 31.3 per cent.

Anerobic Process Unaffected by Fluorides—Despite the embarrassing situation revealed by analysis of established statistics, the author does not deny that there is some influence exerted by calcium active fluorides

[4]op. cit., page 15.

Brentford, Ontario; Permanent Teeth

Age	DMF Before Fluoridation 1944-45	DMF After Fluoridation 1951	Percent Increase (I) or Decrease (D)	Estimated Maximum No. Permanent Teeth	Author's Corrected Estimate
6	0.41	0.11	73.2 (D)	12	2.50
8	2.44	1.07	56.1 (D)	16	8.57
10	3.80	2.57	32.4 (D)	24	5.12
12	6.30	4.31	31.6 (D)	28	7.11
14	8.60	6.41	25.5 (D)	28	7.82

Effect of Fluoridated Water on Deciduous Teeth

Place	Age	Before Fluoridation 1944-45	After Fluoridation 1951-52	Percent Decrease
Grand Rapids, Michigan	4	4.2	2.13	49.2 (D)
	5	5.4	2.27	57.7 (D)
	6	6.4	2.98	53.7 (D)
	7	6.3	4.03	35.9 (D)
	8	5.8	4.12	28.7 (D)
	9	4.6	3.86	15.9 (D)
	10	2.8	2.43	14.4 (D)

Rate of Deterioration or Improvement

Age Group	Before Fluoridation 1944-45 Per Cent (D) or (I)	After Fluoridation 1951-52 Per Cent (D) or (I)
4-5	28.57 (I)	6.6 (I)
5-6	18.44 (I)	31.3 (I)
6-7	1.56 (D)	35.3 (I)
7-8	7.93 (D)	2.21 (I)
8-9	20.69 (D)	6.31 (D)
9-10	39.13 (D)	37.14 (D)

in the water over vital processes of fermentation in the young as well as all other vital processes, but once the cavity has been formed and the process of fermentation becomes anerobic, fluorides will have no influence whatever on the process of fermentation, but continue progressively to exert an influence over the vital processes within the body.

It is clear from the discussion that the statistical evidence submitted is not applicable to any individual or group of individuals, since the figures fail to satisfy the requirements of the two platitudes stated at the beginning of this article:

1. A tooth in which caries does not occur must be counted as a sound tooth and must be credited to the subject or group and included in the statistical evaluation.

2. A tooth is not a dentition but only part of a dentition. Any statistical figures, therefore, which do not relate teeth to the dentition as a whole are meaningless.

It is obvious from the discussion that the teeth of the subjects of one group are compared only with the teeth of a similar group of different subjects, and the slight difference noted after fluoridation is exaggerated because there is a failure to correlate or associate the teeth with the dentition of individual persons or groups of persons.

The whole statistical claim is equivalent to contending that a box of burs containing one defective bur, no matter what the number of burs in the box, is superior by 50 per cent to any other box of burs which contains two defective burs, and this fallacious argument runs through the whole range of figures presented for public consumption.

It is apparent even from a casual reading of the figures that the percentage decrease falls rapidly with advancing age, and in omitting to compare the rate of deterioration of the dentition before and after fluoridation, Public Health authorities have omitted to deal with perhaps the most important aspect of caries control, for it is unsound to lay claim to a reduction in the number of carious teeth without seeking to confirm, by whatever method of statistical evaluation, that the rate of deterioration in the dentition after fluoridation also shows a consistent decline.

Caladh, Fort William
Inverness-Shire, Scotland

Headache from Temporomandibular Joint Dysfunction

FINDINGS are reported in a series of 92 women and 13 men whose chronic headaches were found to be associated with temporomandibular joint dysfunction (Costen's syndrome).

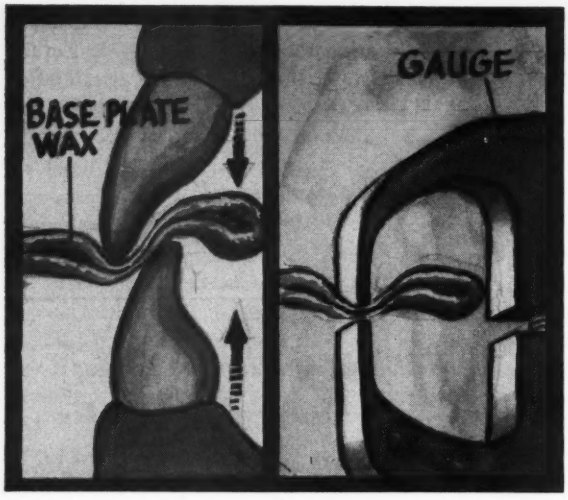
Condition Frequent

Within less than three years the hospital question dealt not only with the 105 patients mentioned but also with 29 others not discussed in the present study because treatment was declined by the patients. All of the 105 patients had suffered from headache for a long time (42 of them for from 5 to more than 20 years).

Response to Therapy

It was concluded that 83 per cent had achieved complete freedom from headache or marked improvement in response to the treatment given. The previous duration of the headache did not influence the therapeutic results obtained. Radical operation was rarely done and the cures effected depended largely on the skill and patience with which each patient was treated. This type of lesion requires the attention of a dentist or oral surgeon with special interest in the condition.

From Foreign Letters, *Journal of the American Medical Association* **160**:698 (Feb. 6) 1956.



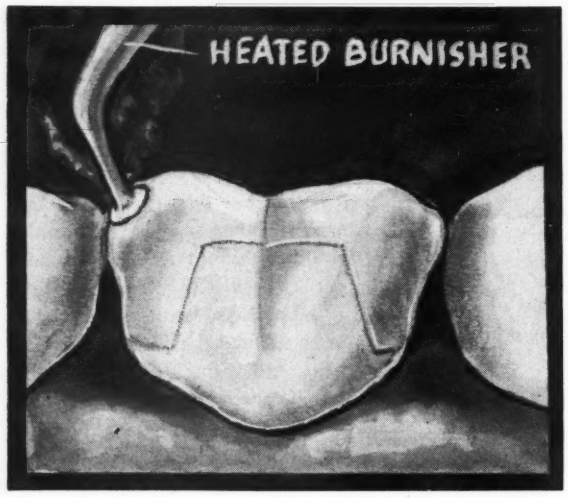
1

Clinical and Laborator

Determining Occlusal/Incisal Clearance

Walter C. Harbart, D.D.S., Los Angeles

1. In the preparation of crowns it is necessary to determine the proper clearance. Have the patient close and "grind" on a piece of baseplate wax double thickness. Chill the wax and measure the thinnest spot with a Boley gauge.

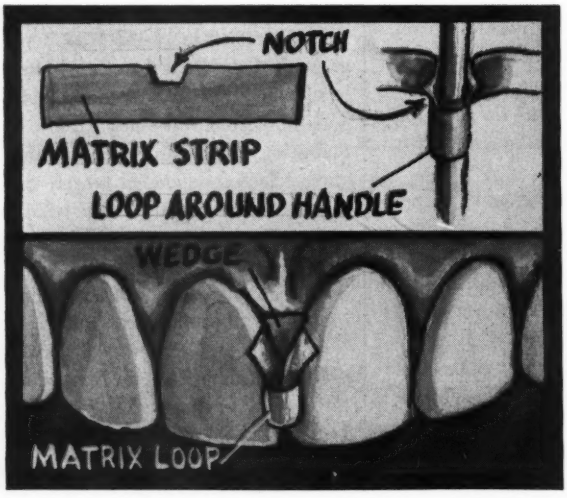


2

Establishing Contact on an Acrylic Crown

Drago Hercog, M.D., Zagreb, Yugoslavia

2. Press a heated ball burnisher against the crown at the proper place to establish a contact point.



3

A Double Interproximal Matrix

Joseph J. Beckner, D.D.S., Loveland, Colorado

3. A length of .0002 stainless steel matrix is notched in the middle. The matrix is then bent around an instrument handle. Slip the loop between the teeth with the notch toward the soft tissue. A wooden wedge is placed through the notch.

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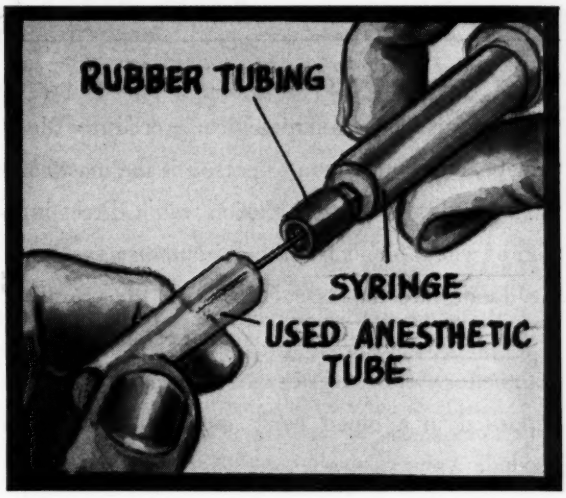
SUGGESTIONS . . .

Protection of Needle Point During Sterilization

William R. Grill, D.D.S., Baltimore

4. A piece of rubber tubing is placed over the wide end of a used anesthetic tube. The syringe is inserted into the tube with the rubber cuff holding it firmly on the hub of the needle.

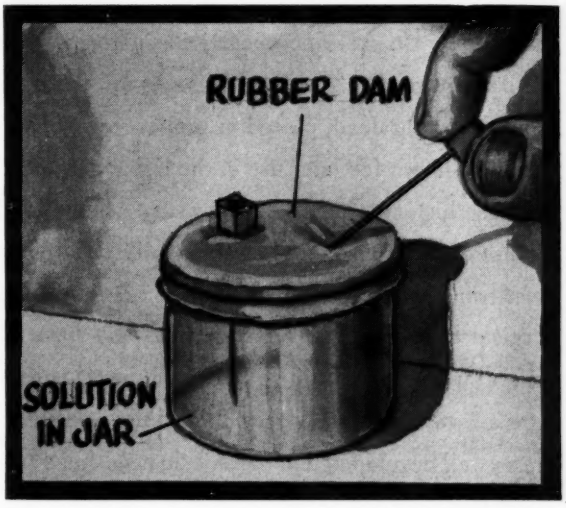


4

Auxiliary Sterilization of Endodontic Instruments

Julius G. Godwin, D.D.S., St. Louis

5. A small jar is filled with sterilizing solution. A piece of rubber dam is stretched over the jar and fastened with a rubber band. Apply sterilizing solution to the surface of the dam. During endodontic operations the reamers and files may be cleaned of gross debris as they pierce the rubber dam. The instruments are sterilized in the solution.

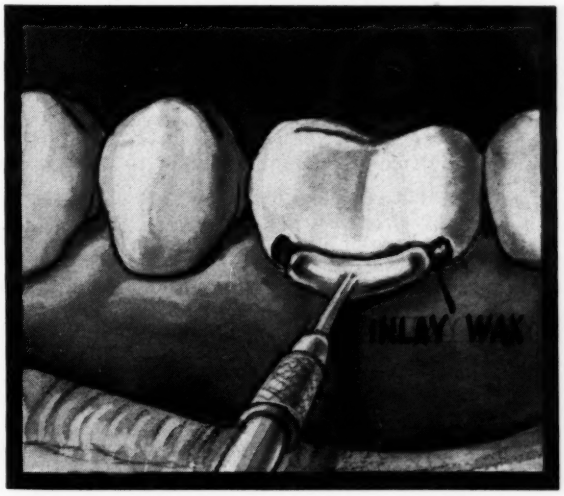


5

Wax Patterns for Class V Cavities

Harold H. Keyserling, D.D.S., New York

6. Mount a concave amalgam plugger in a proper handle. The plugger will compress and neatly adapt the inlay wax in the cavity.



6

technique involved; and jot down the advantages of the technique. This shouldn't take ten minutes of your time. Turn to page 370 for a convenient form to use.

Send your ideas to Clinical and Laboratory Suggestions Editor, DENTAL DIGEST, 708 Church Street, Evanston, Illinois.

The EDITOR'S Page

THE TRANSPLANTATION of tissues from one person to another is a common biological procedure. Blood transfusion from person to person is the most common. Originally the transfusion was a direct infusion of whole blood from the circulatory system of the donor into the vascular tree of the recipient. With improved methods to control coagulation and with better systems of storage, blood is now usually deposited in a blood bank and withdrawn when needed.

The transplantations of the eye, of skin, of bone from one person to another are relatively well-known surgical procedures. Originally these transplants or grafts were between living persons. Now the bank principle is used and tissues are removed from the recent dead, placed in proper storage, and then withdrawn for later use in the living subject.

In the history of dentistry there are examples of the use of the transplantation principle. Teeth have been transferred from one mouth to another. This surgical method has never come into any form of general use—nor should it. Artificial dental substitutes are so well conceived and the skills of dentists are so well developed that there is no need for transplantation.

There is one field of clinical dentistry wherein the transplant principle should have merit. If the bone lost in periodontal disease could be replaced by bone from a donor, from a tissue-compatible animal, or by autogenous graft we would have made a significant advance in the treatment of supporting tissue disease.

Hans Forsberg of Stockholm, Sweden has reported his experiences in using sterile ox bone or autogenous bone chips in the surgical management of periodontal disease.[1] In his series he reports on 11 cases: one was "excellent"; seven were "satisfactory"; three were "unsatisfactory."

The author describes the underlying principles: "The ideal must be to replace by surgery the bone that has been lost around the teeth and not to increase the destruction already caused by the disease.

"The principle underlying bone transplantation of this kind is that the proliferating tissue in the implant bed grows into the bone canals of the implant and develops new bony tissue, in particularly ample amounts in the spaces between the implant and the compact bone of the bed and the periosteum."

This is the description of the surgical technique:

"Operations were performed as follows: After incision along the gingival margin and vertically, a flap was bent back. All granulation tissue was carefully scraped away from the pockets in the bone. No bone was removed. After rinsing of the wound, *os purum* (sterile) [ox bone] was deposited in the pockets concerned. Ground implant was packed as tightly as possible up to just over the bone margin. Then followed suturing, in which the greatest importance was attached to bringing the edges together as closely and tightly as possible. For this reason suturing was done, not only between the teeth, but with additional sutures round each tooth. On completion of the operation, a transparent fixation-splint of a special type was applied, which allowed inspection without a change of dressing; this splint was made before the surgical procedure was carried out.

"The method described has recently been modified so that instead of *os purum* the author has used bone from the patient, taken from the iliac crest, in the form of bone chips. After the removal of such a small piece of bone, it was transferred to a mortar specially designed for the purpose where it was ground, and then immediately applied in the pockets concerned."

[1]Forsberg, Hans: Transplantation of Os Purum and Bone Chips in the Surgical Treatment of Periodontal Disease (Preliminary Report), Acta Odontologica Scandinavia **13**:235 (February) 1956.

MEDICINE and the Biologic Sciences

Scars

During wound healing many local factors affect the formation of scars. Facial wounds are seldom infected, especially with aerobes, since the blood supply in the face is more abundant than in the buttocks, back, and legs. Sutures can be removed earlier because of the good blood supply and little tissue turgor.

When infection does occur, scarring results in direct proportion to duration and degree of infection. Retained foreign bodies also cause unsightly scars as early inflammatory reactions give way to fibrosis. Massive reaction may occur around organic material, dead tisue, incarcerated hair, or extravasated blood.

Rest is an important factor in wound healing. Continued motion during healing, particularly of wounds on joint surfaces, produces massive scars. Immobilization by splint, cast, or pressure dressing will reduce redness and swelling. The subsequent scar is small and soft.

Incisions or wounds under tension heal with excessive fibrosis. Incisions should be made, therefore, and wounds closed in the lines of skin tension, in general in the normal creases of the skin. Wounds perpendicular to these lines, especially over the flexor joint surfaces, often heal with large band-like scars.

Wound healing is also affected by racial, endocrine, and dietary factors. Negroes have tendencies toward keloids or hypertrophy of scar formation. Heavy scars are often seen (1) in young persons in whom growth is rapid, (2) during periods of endocrine stress as at puberty. (3) during pregnancy, (4) in patients with thyroid dysfunctions, and (5) after severe burns.

Early closure of facial wounds is important to prevent massive scarring. The surrounding skin is cleansed with soap and water, with the wound protected by a sterile saline dressing. The wound is then flushed with sterile saline and redraped. The traumatized area is explored, and the dead spaces are closed, clots evacuated and foreign bodies and dead tissue removed.

Scars should not be revised until at least six months after the initial trauma. After excision of the scar, undermining laterally into the subcutaneous tissue usually permits closure in the direction of the skin tension lines without difficulty. To prevent depression in deeply scarred areas, only the surface part of the scar is removed.

Robinson, David W.: Scars, Missouri M. **51**:729-734 (September) 1954.

Kidney Stones

In every instance of renal stone the mechanism of calculus formation should be determined. There are a number of tests available for this purpose. Frequently several factors may be operating in the same person. And often, the most obvious is not always the most important.

If the urine contains large amounts of calcium or uric acid, stones are apt to form more frequently and rapidly. Calcific deposits are favored by conditions involving skeletal breakdown, such as (1) immobilization after injury or during poliomyelitis, (2) cancer metastases to bone, (3) Cushing's syndrome, (4) vitamin D poisoning, and (5) parathyroidism.

Urinary infection greatly increases likelihood of stone formation, especially with alkalinizing organisms that split ammonia from urea. Calculi that result directly from infection consist of calcium salts. Infection can be the major factor in stone formation even when associated with large amounts of calcium or other predisposing components. Bacteria are incriminated by high content of ammonium or magnesium phosphate in the calculi.

The composition of stones should be known, for their proper management. The majority are not absolutely pure, but the chief crystalloid in generally shown by simple chemical analysis.

The type of stone cannot be identified without analysis. Gouty subjects may have calcium concretions and even cystinuria subjects may have no calculi or may have deposits of wholly different origin.

Patients should be questioned regarding alkali and vitamin D ingestion. The public still consumes large amounts of antacid powder and tablets for digestive complaints, raising urinary pH and increasing precipitation of calcium complexes. Vitamin D may induce calcuria even without calcemia.

Painful attacks due to uric acid stones may be abolished by reduction of dietary protein, increase in fluid intake and moderate alkalinization of urine. In some cases, urinary infection can be eradicated even if a calculus persists and in many others treatment will prevent further renal injury and enlargement of the stones. Bacteria may be rendered harmless, if not killed by moderate doses of a sulfonamide or antibiotic, given intermittently for several days at a time.

No method of improving faulty cystine metabolism is known but as a rule concretions are avoided by forced fluids and alkaline urine.

CLINICAL AND LABORATORY SUGGESTIONS

(*See pages* 366 *and* 367)

Form to be Used by Contributors

To: Clinical and Laboratory Suggestions Editor

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Formation of cystine or uric acid stones is generally prevented if alkalinity is maintained for eighteen or twenty hours a day and if enough fluid is taken to require diurnal polyuria and nocturia.

Howard, John Eager: Management of Calculous Disease, Renal Calculous Disease, J. Urology **72**:999-1008 *(December)* 1954

Myocarditis—Incidence

Myocarditis is an acute, subacute, or chronic inflammation of the heart. It may be either focal or diffuse. The total pathologic incidence of myocarditis, as determined by extensive autopsy studies is about 10 per cent when patients dying of infectious diseases are included. The clinical incidence is distinctly lower.

The condition may be classified into four main types: (1) that which occurs after infectious diseases, with or without endocarditis; (2) that which is specific, with characteristic anatomic structure or identifiable pathogenic organism, such as rheumatic fever, tuberculosis, or blastomycosis; (3) that which is due to chemical poisons, physical agents, or hypersensitive states, and (4) that which is isolated and unassociated with known illness.

The diagnosis is difficult because of the lack of specific symptoms and signs. Symptoms may be slight or completely lacking and frequently are caused by the primary disease. The signs of heart failure or peripheral collapse may be found. Tachycardia is not common but bradycardia frequently occurs, especially in children and young adults.

The appearance of arrhythmia with an acute infectious disease should arouse suspicion of underlying myocarditis. Such abnormal rhythms as premature supraventricular tachycardia, artrial fibrillation or flutter, and idioventricular rhythm may occur. The disturbances seem to occur most frequently with rheumatic myocarditis.

The heart may be normal or en-

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larged in size. An apical systolic murmur due to mitral incompetency is commonly heard. Rapid or gradual progression of myocardial insufficiency is an outstanding feature of isolated myocarditis. Fever, leukocytosis, and sedimentation rate are of little diagnostic aid and may be normal with myocarditis. Hypotension and a small pulse volume are occasionally noted.

Many of the electrocardiographic changes seen with myocarditis are due to extracardiac conditions or to cardiac disease other than the myocarditis. Extracardiac causes include (1) chemical and electrolyte disturbances, (2) mechanical effects such as hypertension, (3) pharmacologic effects, and (4) thermal effects, namely, hyperpyrexia. Cardiac causes include previous or progressive valvular deformities or myocardial necrosis.

Treatment and prognosis depend primarily on the underlying disease of which myocarditis is a complication or manifestation. Bed rest and supportive measures are necessary with all forms of myocarditis until clinical manifestations and electrocardiograms indicate quiescence.

De La Chapelle, Clarence E., and Kossman, Charles E.: Myocarditis, Circulation **10**:747-765 (September) 1954.

Arthritis and Injury

No authority has yet come forward with the claim that a single trauma to a joint, even severe, has anything to do with the production of degenerative arthritis or exacerbation of a preexisting arthritis, unless the trauma produces some irregularity of the joint surfaces resulting in abnormal friction during motion or unless it produces a malalinement of the joint resulting in increased stress and strain and wear and tear during motion.

Classical degenerative arthritis rarely occurs in young people. One sees young adults, however, with changes radiologically and pathologically identical with degenerative arthritis, particularly in the knee. Almost without exception these patients are overweight and/or have joints which are mechanically unsound due to congenital anomalies in development. These changes usually have occurred during the growth period or are internal derangements due to injury.

Injury must be severe enough to produce irregularity of the joint or a disturbance in alinement. Faulty spinal posture undoubtedly contributes to the development of degenerative arthritis of the spine. Once the arthritis has become established and a part of the pathologic process, the ligaments lose their elasticity and hence may tear rather than stretch if put under sudden tension. The immediate symptoms are more severe and persist for a longer period than would be anticipated in a younger person with a normal spine. The persistence of symptoms, therefore, should not be interpreted as an indication of an extension or exacerbation of the arthritic process.

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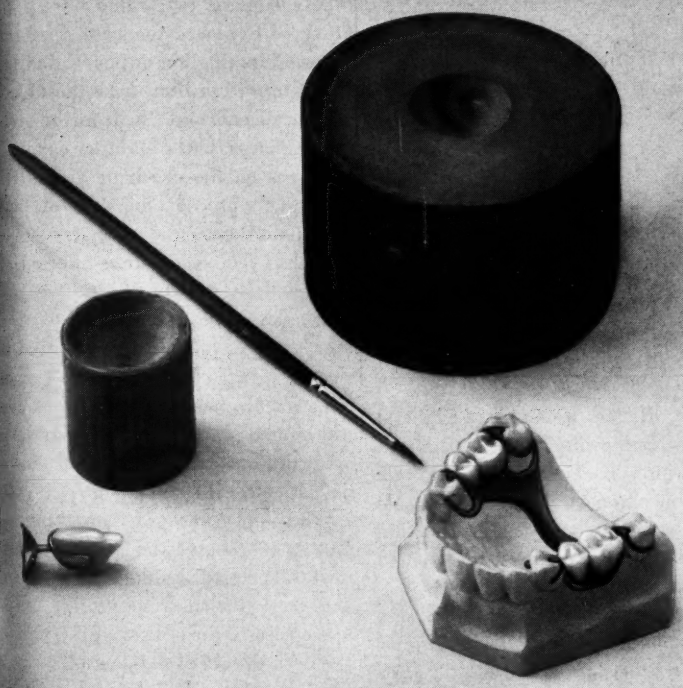

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Select crown a size smaller than prepared tooth; cut gingivally to tooth height, fill with temporary cement and seat on tooth. Crown adapts to contour as it is being seated.

Since it work-hardens during use, the crown need not be replaced until the permanent casting is installed.

Summary

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[1]*For details, write to Parkell Co., 116A East 18th St., New York 3, N.Y.*

back are injured severely enough to produce considerable weakness in them for a long period, it is conceivable that this weakness might encourage an existing poor posture and thus contribute to an increase in spinal arthritis. It is unlikely that a minor lifting strain could produce such weakness.

The lack of regenerative power in articular cartilage is well recognized. It is likewise recognized that even slight trauma to articular cartilage may produce irreversible damage and chronic degenerative changes which gradually increase in severity with function. An injury of sufficient severity can be assumed to produce possible arthritis if it results in (1) permanent impairment of the circulation to subchondral bone, (2) irregularity of articular surfaces, (3) malalinement of the joint, or (4) a combination of these three factors.

Durman, Donald C.: Arthritis and Injury, J. Michigan M. Soc. ***54***:301-303 *(March)* 1955.

Lung Cancer— Early Diagnosis

The greater use of chest roentgenray examinations can increase the incidence of successful pulmonary resections for cancer. Asymptomatic peripheral lesions, formerly undetected until metastasis or extrapulmonary extension occurred, are often evident on a roentgenogram while extirpation is still feasible.

Every physical examination should

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include chest roentgenologic examinations. Patients should always be questioned about respiratory symptoms. Examination of all male patients over 40 years of age for lung cancer is advisable.

Shadows on films of adult males that cannot be explained should be considered as possible neoplasms. Exploratory thoracotomy is recommended if diagnosis is doubtful. The mortality for the procedure is less than 1 per cent.

The interval between onset of symptoms and surgery has not been diminished in the last ten years. Delay in diagnosis caused by widespread use of antibacterial drugs offsets increasing awareness of physicians. Prolonged antibacterial therapy should be avoided.

Surgery is feasible for only half of patients with pulmonary cancer when the diagnosis is made. Operation is not recommended if distant metastasis is evident, the cancer has extended into the chest wall, pleura, mediastinum or other adjacent structures, bronchoscopic study shows that the cancer is above the carina or in the opposite bronchus, or if the patient is a poor surgical risk.

Resection of all or part of a lung is accomplished for only about half of the patients operated on. Operation is limited to lobectomy if diagnosis is established only by surgical exposure, if the lesion is peripheral and located away from the fissures and lymph nodes are not affected, or if pneumonectomy is not feasible because of low pulmonary function and the lesion seems amenable to lobectomy.

The five to ten-year survival rate of patients with lung cancer is around 6.3 per cent. The survival rate after surgical therapy is about 31 per cent.

Jones, John C.; Robinson, Joseph L.; and Meyer, B. W.: Primary Bronchogenic Carcinoma of the Lung, Arch. Surg. **70**:265-275 *(March)* 1955.

Nature of Bell's Palsy

The great auricular nerve is purely sensory. Some of its fibers join the facial nerve and with it pass to all parts of the face. Irritation or injury to this nerve or the cervical nerve roots or segments from which its fibers originate may lead to facial palsy of the lower motor neuron type. This palsy possesses features identical with those of Bell's palsy even though the facial nerve is not directly affected.

Herpes zoster of some zonal areas including the trigeminal area and the so-called otic zoster may be complicated by facial weakness (transient or permanent) similar to that found in Bell's palsy. Facial weakness and spasm may also be seen after irritation of the great auricular nerve by trauma, irradiation, and alcohol.

Patients with typical Bell's palsy of the rheumatic type often have a history of exposure to drafts or dampness. Pain, tingling or neuralgia in the retroparotid region, over the side of the head and neck, in front of or behind the ear, in the auditory canal and perhaps on the cheek or around the eye often precede the onst of palsy by some days.

All of the regions thus affected are supplied by the fibers of the great auricular nerve and are those to which pain radiates when the nerve is injected with alcohol. Acute tenderness on pressure has also been noted over the course of the great auricular nerve as it lies on the sternomastoid muscle in patients with Bell's palsy.

The appearance of symptoms before the onset of the palsy suggests that the primary lesion is a neuritis of the great auricular nerve, set up in some cases by exposure of the side of the neck to cold or dampness and later extended to the facial nerve. Infiltration of the great auricular nerve with 2 per cent cocaine is often followed by immediate and complete relief of the pain and the disappearance of the swollen, numb or tight feeling in the face and head. This relief continues as long as the anesthetic lasts. Even after the anesthetic wears off, the pain and paresthesia continue to be greatly diminished or almost nonexistent.

Wyburn-Mason, R.: The Nature of Bell's Palsy, Brit. M. J. **2**:679-681 (*September* 18) 1954.

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In most cases a minimal adult dose of 250 mg. four times daily is sufficient. For children, the dosage is proportionately less (based on 10 mg. per lb. daily, in divided doses).

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Contra-Angles

The Care and Treatment of Speakers

Within the dental profession 86 per cent of the members belong to the American Dental Association. This is the highest percentage of membership of any professional group (physicians 83 per cent, accountants 50 per cent, lawyers 24 per cent).

With such a commendably high ratio of membership it would be expected that dental meetings should be well attended. They are in some parts of the country. In other places the pressures of other affairs and interests are such that the attendance at meetings represents a small part of the membership. If a study were made on "Why Dentists Stay Away From Meetings" several revelations would emerge. *One* of the reasons for poor attendance at local meetings would be directly expressed: uninspired programs and poor internal management of the society.

The audience of dues-paying members of any meeting are entitled to a well-planned and managed meeting. Lively and informative meetings do not just happen. The speaker who makes the meeting a success or failure has a right to expect the courtesy of good organization and proper conduct of the program.

Every dentist who finds himself occupying an office as program chairman or president of his dental society will profit from a study of the immensely practical book *How to Manage Your Meeting* by Harold W. Donahue (Droke House, Publishers, Indianapolis 6, Indiana). Every dues-paying member in the audience will acclaim his colleagues-in-charge who have studied this book and put the suggestions into use.

In one chapter that might be called "The Care and Treatment of Speakers" the author gives some suggestions that if followed will bring joy and praise from every speaker.

Here are ten pointers mentioned by Mr. Donahue in that one chapter:

1. "Place the *head table* on a platform elevated a few inches above the floor level. This is part psychological, but there are other practical considerations. The elevated platform provides a better view of the speaker and tends also to improve acoustics . . .

2. "Remember the amplifier is primarily for the comfort of the audience. It is not for someone on the platform to determine arbitrarily whether or not he 'needs' the aid . . .

3. "If everyone must have a ticket make sure that your invited guests are provided with them . . . The practice of writing 'Complimentary' across the face of a ticket is an unwarranted rudeness . . .

4. "What to do with the speaker for the half-hour preceding a meeting may present something of a problem . . . I strongly suggest that you keep your speaker in semi-retirement un-

til it is about time for him to join the marching line.

5. "Should it develop that your speaker is a 'drinking man' a cocktail may be suggested. (But unless you know your speaker's capacities very well, indeed, never allow time for more than two drinks!) . . .

6. "When speakers encounter a little special consideration, such as being met on arrival, or an air-conditioned hotel room specifically reserved and ready for immediate occupancy, they are almost pathetically grateful . . .

7. "Good speakers get around. They talk with other speakers. In the swapping of experiences they will dwell on their pleasanter engagements . . .

8. "If the speaker does not smoke don't blow smoke in his face ten minutes before he is going to get up and talk. Maybe he *is* hardened to it, but even an inveterate user of tobacco doesn't relish clouds of second-hand smoke . . .

9. "When the meeting is over and the speaker has received the polite plaudits of all and sundry don't leave him high and dry, with a few words of perfunctory thanks. Stick around for a little chat; perhaps a relaxing drink together . . .

10. "And finally, don't forget the day after. Be sure to write that warm, sincere note of thanks."

Those who attend dental society meetings should remember that the speaker is not a professional who does this *work* for a living. He is a fellow dentist who is making a sacrifice to be on your program. He is not an entertainer or a paid employee. He has taken time from his busy life to give *you* information for *your* benefit. Any honorarium that he has received is likely less money than he would have earned if he had stayed in his office.

We should learn to treat our speakers as guests entitled to respect, attention, and every courtesv. In some parts of the country the dental societies have developed hospitality to the fine degree where speakers are delighted to accept an invitation. New Orleans and St. Louis are good examples of the best in courtesy to speakers. In other parts of the coun-

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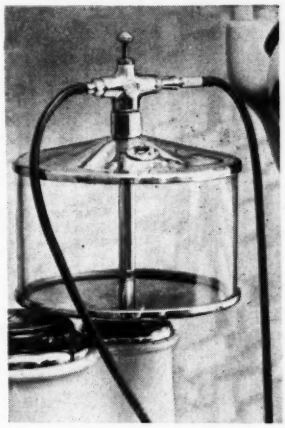

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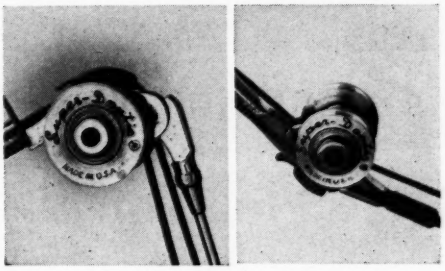

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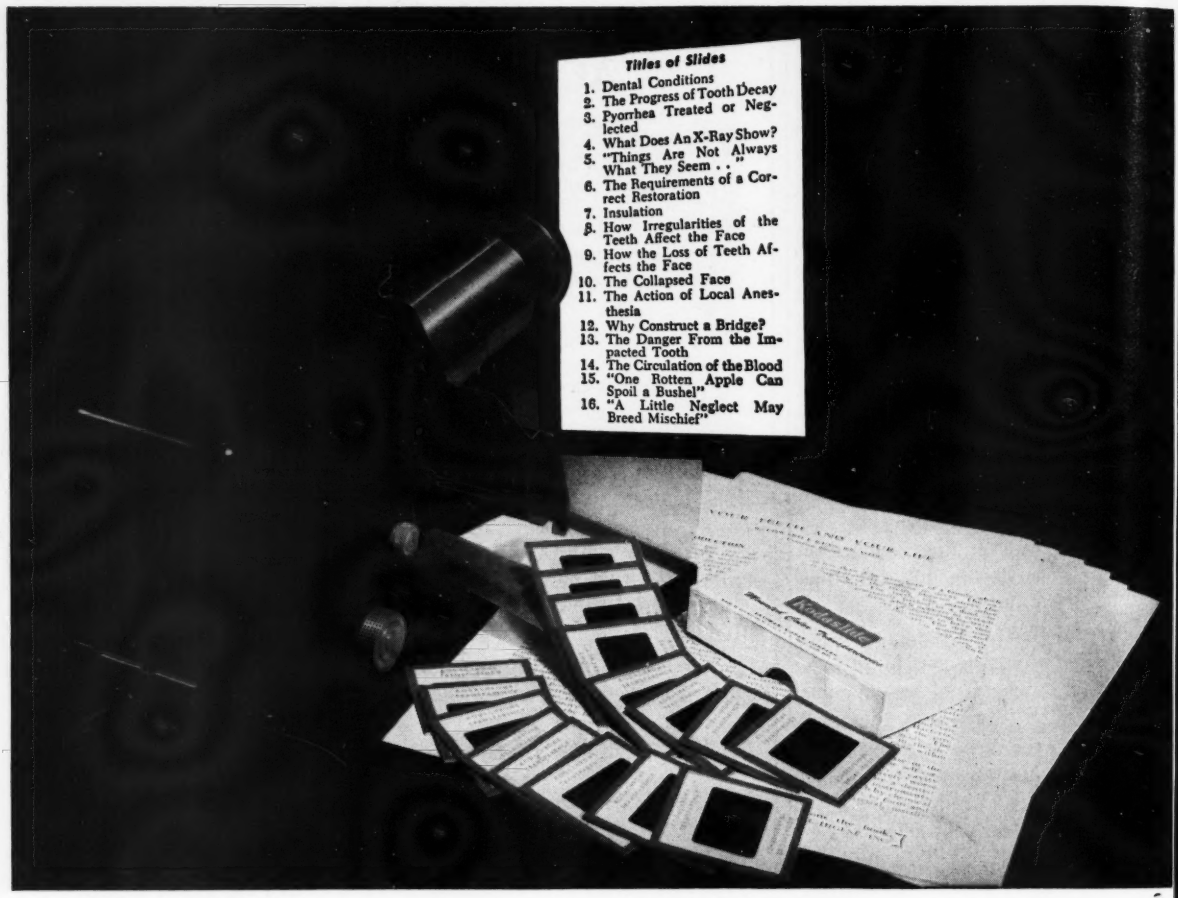
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try boorishness and rudeness prevail. I would rather not mention these places, but if *your* society is having trouble getting good programs it may be on the taboo list. Better take a look!

—E. J. R.

Fluoridation of Water

One of the reasons why a cautious trial of water fluoridation is desirable is that some members of the community, and not only laymen but informed medical men also, are opposed on various grounds to the introduction of fluoridation, or are not convinced that it is the best way to diminish dental caries, or question whether its safety has been determined with sufficient certainty.

Ministry of Health Consulted—Controversy on the subject is not confined to the lunatic fringe of society, and, no doubt conscious of this, the Ministry of Health recently sought again the views of the Medical Research Council on the possibility that fluoridation might be harmful. Having received advice from the Council, the Ministry issued a statement "that there is no evidence warranting alteration or abandonment of the fluoridation projects."

No Definite Evidence of Harmful Effects—The statement goes on to say that "there is no definite evidence that the continued consumption of fluorides in water at a level of about 1 part per million in drinking-water is in any way harmful to health," and the Medical Research Council experts "consider that if any untoward effect is revealed by future research this is most unlikely to be serious."

Proof of Safety Unattainable—As the statement implies, proof of absolute safety is virtually unattainable, at least with the data so far gathered, but the Medical Research Council's advice to go on with the projects will command respect and is reassuring; the measure would appear to be "safe, unobtrusive, and beneficial," as it was described in these columns about two years ago, even though "the increase in dental caries observed since the war . . . would scarcely be reversed by the fluoridation of drinking water."

Study of Causes of Caries Vital Need

Perhaps the most urgent need at present is to direct the necessarily limited resources of research to elucidating not so much the effects of fluoridation as the causes of caries. Fluoridation is unlikely to be the last word on the subject; its mode of action is unknown, and other measures such as alteration in diet and regular use of the toothbrush may prove to be more efficacious.

Possible Reason for Increase—The incidence of caries is believed to have increased in Britain greatly in recent years, and one possible reason for its having done so is the consumption of sweets, now enormous in comparison with before the war. While the addition of sugary foods to the diet does not as such seem to increase the incidence of caries, the taking of sweets

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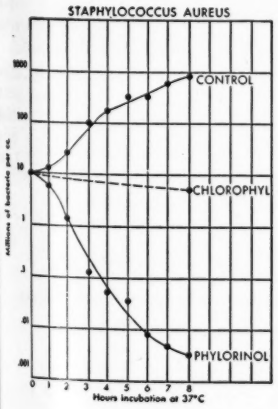

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and other carbohydrates between meals, so that fragments of them are continually in the mouth has been found to do so.

Presence of Acid on Tooth Surface—Work in Sweden and the U.S.A. has shown that "the prime factor in the cause of dental caries is the concentration of acid in the mouth and the length of time it is present on the tooth surface . . . When fermentable particles of food lodge in these areas several times a day and, owing to their sticky nature, remain there for some time, these particular sites on the tooth surface become carious."

Effects of Carbohydrates Between Meals—The British Dental Association's Child Dental Health Committee concluded in an influential memorandum that the literature contains "ample evidence, based on acceptable research, that carbohydrates taken *between* meals will cause loss of dental health." If these views are confirmed, then fluoridation should be backed up with a campaign to discourage children from eating sweets virtually all day long, as many now do.

Adapted from *British Medical Journal* No. **4979** (June) 1956.

Nutritional Relationships to Dental Caries

JAMES H. SHAW, Ph.D., Boston

Summary

Many of the details of the relationship of nutrition to the development, maturation, and maintenance of teeth are not understood. However, it has become obvious that the nutritional quality of diet is of real importance in each of the three phases of the life history of teeth.

Recommended Dietary Regimen—The best advice for any age group about the dietary regimen which will provide the best opportunity for healthy teeth is simple and straightforward. The following considerations are recommended:

1. Each of the basic seven food categories should be represented liberally in each day's diet, and as many as possible should be present in each meal.

2. For dental health, the best selection of foodstuffs is one where as many of the foods as possible are purchased in their natural state without excessive refining and where cooking procedures are mild with concerted efforts to conserve the original nutritive value of the foods.

3. A liberal source of Vitamin D should be provided daily throughout the entire period of a person's growth and development.

4. A minimum of sticky, high-carbohydrate foods which have a low rate of clearance from the oral cavity should be consumed. As snacks, in place of the above materials, fresh fruits, vegetables, fruit juices or milk are much to be preferred from a dental standpoint.

5. In the overall program, one of the most important facets which has to be considered on a nutritional level is the fluoridation of public water supplies.

Nutritional Objective—Unquestionably the greatest present hope for a reduction in the dental caries experience in future generations lies in the development of teeth with a higher resistance to tooth decay. By reason of the prolonged dental developmental period, this is not an objective that can be accomplished overnight, but

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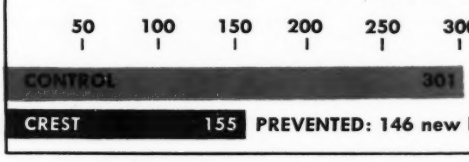

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requires ideal nutrition day by day for years. Furthermore, this objective is a difficult one because the results are not immediately evident when the teeth erupt into the oral cavity. Probably there is no better current example to demonstrate that the food eaten today determines welfare not only tomorrow, but a decade or decades later in life. The success or failure of this type of nutritional program ultimately depends upon the education of the individual consumer to appreciate the importance of good nutrition every day and at every meal.

Adapted from *Borden's Review of Nutrition Research* **16**:13 (January-February, 1955.

The Object of Science

THE SCIENTIST should be a man willing to listen to every suggestion, but determined to judge for himself. He should not be biased by appearances; have no favorite hypothesis; be of no school; in doctrine have no master. He should not be a respecter of persons, but of things. Truth should be his primary object. If to these qualities be added industry, he may indeed hope to walk within the veil of the temple of nature.—Michael Faraday.

From *Science* **122**:188 (29 July) 1955.

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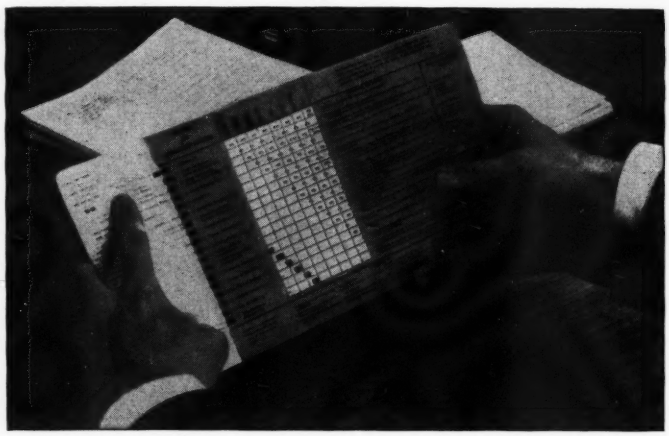

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